APRIL 22, 1957

ANNUAL AIR TRANSPORT PROGRESS ISSUE

Growth study of the airline industry . . . . . Page 35
Airways are not ready for jet transports . . . . . Page 71
1956 Airline operations statistics . . . . Page 113

AMERICAN AVIATION

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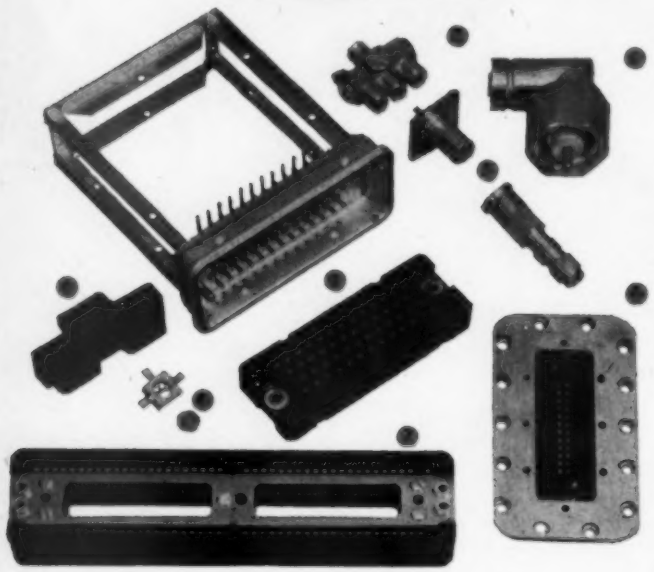

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EDITORIAL OFFICES: 1001 Vermont Ave., N. W. Washington 5, D. C., U.S.A. Phone: Sterling 3-5400. Cable: AMERAV. **Advertising Offices:** 17 East 48th Street, New York 17, N. Y., U.S.A. Phone: Plaza 3-1100.

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REGIONAL OFFICES . . . New York City: 17 East 48th St., New York 17, N. Y. William H. Pearson, director of advertising; Edward D. Muhlfeld, assistant director of advertising; M. Michael Cerick, Paul Kinney, and Robert Weston, regional advertising managers. Phone: PLaza 3-1100. **West Coast:** 8943 Wilshire Boulevard, Beverly Hills, Calif., Fred S. Hunter, manager; John Ball, Jr., and Walton E. Brown, regional advertising managers. Phone: Bradshaw 2-6561, and Crestview 6-6605. **Canada:** Allin Associates, 12 Richmond Street, East Toronto, Ontario. Phone: Empire 4-2001, Allin Associates, 1487 Mountain Street, Suite 4, Montreal, Quebec. **Chicago:** 139 N. Clark St., Chicago 2, Ill. Laurie S. Seward, regional advertising manager. Phone: Central 6-5804. **Dallas:** 4924 Greenville Avenue, Dallas 6, Texas. Phone: EMerson 1-4507. Richard A. Worthington, regional advertising manager. **Detroit:** 201 Stephenson Bldg., Detroit 2, Mich. Phone: TRinity 5-2555. Kenneth J. Wells, regional advertising manager. **Cleveland:** Hanna Bldg., Room 1046, 1422 Euclid Avenue, Cleveland, Ohio. Phone: PRospect 1-2420. Douglas H. Boynton, regional advertising manager. **London:** The AAP Company, 17 Drayton Road, Boreham Wood, Hertfordshire, England. Phone: ELStree 2688. Cable Address: STEVAIR, London. **Paris:** Jean-Marie Riche, 11 Rue Condorcet, Paris (9e) France. Phone: TRU 15-39.

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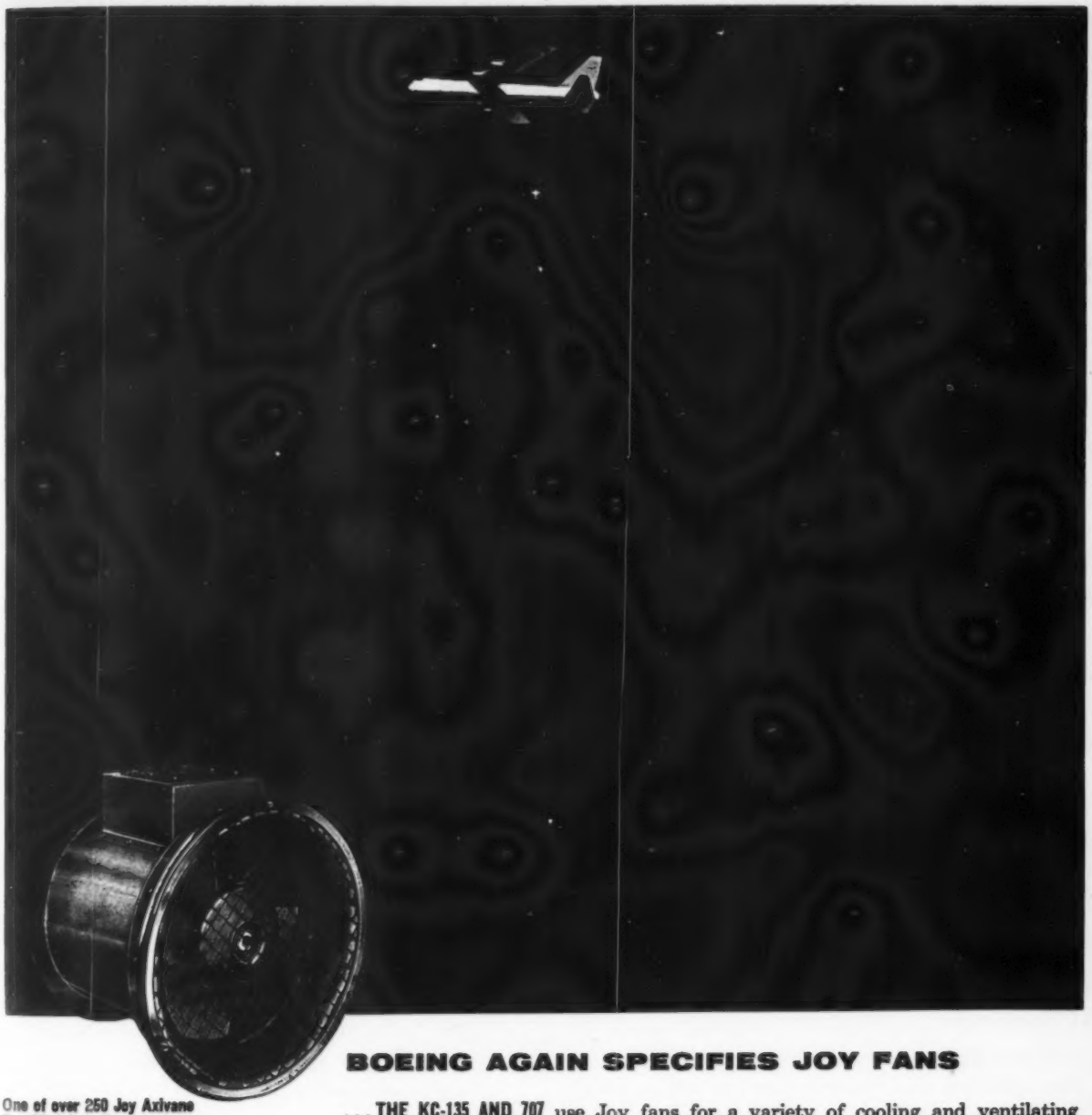

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ANNUAL AIR TRANSPORT PROGRESS ISSUE
(Including 18th Edition of *Air Transport Facts and Figures*)
APRIL 22, 1957—VOL. 20, NO. 24

AMERICAN AVIATION

WORLD'S LARGEST AVIATION PUBLISHERS

Airline dilemma: big traffic, low profits

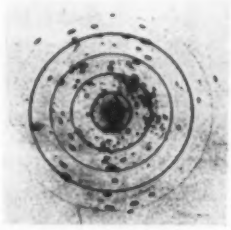
Shrinking net operational income worries the industry (Page 31), but airlines will go ahead with what they have on order and the jet age will arrive with several types aircraft (Page 68).

Air cargo makes gains toward real potential

Ton-miles carried during 1956 were up 21% over 1955, with air freight the biggest single factor. Scheduled trunk airlines carried largest volume. For analysis see Page 47

Two hundred blips on a radar screen

Our airways are not ready for jet transports. Sam Saint, who flies DC-7s for American and recently flew cross-country in the Boeing 707, tells why. Page 71



MATS faces a major reorganization

Political pressures are about to take their toll of the "world's largest airline," which last year averaged an ocean crossing every 23 minutes, set a new safety record. Page 83

Contents

U. S. INDUSTRY ROUNDUP
Shrinking profits worry airlines 31
Eastern takes aircoach lead 33
A growth study of U.S. airlines 35
Why airlines prefer 3-letter codes 52

INTERNATIONAL
Transatlantic passenger traffic up 20% 36
World revenues to top $4 billion in '57 38
French airlines carry 3 million passengers .. 45
How Tito's airline operates 163

AIR CARGO
All records topped in 1956 47
How to load 35 tons in 41 minutes 179

FINANCIAL
Selected airline expenditures 54
Airlines strong in traffic, weak in earnings.. 59
Scheduled airlines' revenues and expenses .. 61

EQUIPMENT
Jet sales shape buyers' market 62
Top buyers of top turbines 68

SAFETY
Airways are not ready for jet transport ... 71
Accident record for 1956 76

MILITARY
MATS faces a major shakeup 83
AF won't give up Logair to Army 93

AIR TAXIS
A small business has a big potential 98

OPERATIONS
Traffic ratings of scheduled airlines 113
Airlines reduce direct operating costs 119
ATC snarl cuts aircraft speeds 126
1956 gas & oil consumption 128
Engine overhauls 130
Crew employment 132

ELECTRONICS
Jet instrumentation lagging 135

BUSINESS FLYING
Curtis finds this field has best potential 141

DIRECTORY OF WORLD AIRLINES .. 144

TRANSPORTS OF THE WORLD 167

DEPARTMENTS
Personal View 9
Letters 10
When & Where 21
Spotlight 26
Facilities 132
West Coast Talk 159
People 161
Transport Changes 164
En Route 198

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Jets and Basic Problems

FOR THIS ANNUAL REVIEW of world air transport there is scarcely any room for debate as to what problem is most dominant today. It is the jet transport.

At present outlook the jets will be upon the airlines before they are fully ready to absorb them into their networks.

Whatever important problems are currently facing the industry—and the increasing crisis in air traffic control is but one of many—these current problems will become even more acute with the advent of turbojets. The industry is facing leadership, manpower, management, operating, economic, airport, sales and passenger-handling problems on a scale never known before—and, we suspect, insufficiently appreciated at the present time.

To a degree which apparently many managements don't want to believe, the airlines as a whole are not providing the dependable kind of service today with piston-engined equipment which the public has been led to expect. With this in mind, the turbojet era looks a little formidable.

It would hardly be expected that the airlines in today's mass transportation market can provide the standard of dependability that existed in the limited DC-3 days prior to World War II. But the airlines sold the mass public on air travel. The public accepted. Yet much of today's airline operating pattern and passenger handling is still based on DC-3 techniques. Managements pretend to discount or disbelieve the increasing squawks which rise in volume every time less-than-perfect weather conditions prevail. Not all problems by any means are beyond the control of management.

The jet era will compound today's problems.

Yes, there are committees at work. Every company has its quota. So does the industry as a whole. But there is a shortage of ideas and imagination and a will to get something done. Always before the airlines have been able to muddle through with each forward step. So why not now, seems to be the attitude. Too much buck-passing. Yet the turbojet era represents a very major step forward—a complete new revolution in the history of world transportation.

No "selling" job on jets should be necessary. The public will accept them—if the routings and scheduling are laid out right. The big task is how to handle the passengers who want to take advantage of the increased speed between A and B. There is so much planning work to be done—now—and so little being done.

Jets and Certification

NOT BY ANY MEANS are the future operators of the Boeing 707s, the Douglas DC-8s, the Convair 880s and the Lockheed Electras the only ones who are faced with problems.

There's one hefty hurdle to reach before the jets are delivered to the customers. This hurdle is certification.

If this multi-million-dollar batch of new aircraft is to reach customers on time, the manufacturers are going to have to pitch in and give CAA some assistance.

Right now CAA is faced with its biggest certification backlog in history. It is also faced with the task of filling sixty engineering vacancies on its staff. In the past year CAA has been able to hire some new engineers, but it has also lost experienced men to industry. It is handicapped by a lower pay scale, to say nothing of the nationwide shortage of trained men. At present outlook CAA is simply unable to accomplish all of its duties under the Civil Aeronautics Act in the time schedule set up for deliveries.

The aircraft builders themselves claim they are short of engineers. True enough, but not as short as CAA. Unless the industry wants to face very costly delays, the companies will have to make available their outstanding specialists for more consultation to provide increased background information in the critical design areas on which the CAA must reach decisions. There is no time to lose right now.

Call it an industry assistance program, if you like. But whatever the nomenclature, CAA faces an impossible task without help. Within a span of two years three big turbojet models come up for certification. The time to ease certification is by assisting on design and other advanced work now.

Wayne W. Parrish

LETTERS

The NEW American Aviation

To the Editor:

Congratulations to you and your staff on the new appearance of AMERICAN AVIATION magazine. I particularly like the new departmental organization of the magazine, and the tear-out arrangement of the "Trends" section. *G. T. BAKER, President, National Airlines, Miami, Fla.*

To the Editor:

I've never understood why the format of so many technical magazines need be as unattractive as they are. Thanks for doing something about one we value. Your new makeup looks wonderful. *DAN THOMPSON, Sales Promotion Manager, Steward-Davis, Inc., Gardena, Calif.*

To the Editor:

I was interested to note the new appearance AMERICAN AVIATION now has . . . I feel that the new typography increases readability, and the new yellow sections seem to highlight the foremost news items in a way that will save my time. I send my best wishes for your continued growth. *H. BUSIGNIES, President, Federal Telecommunication Laboratories, Nutley, N. J.*

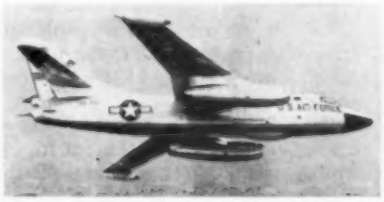
To the Editor:

Congratulations on the new format. I've just read the March 11 issue and you deserve sincere congratulations on a good job done better than ever. *R. C. OERTEL, Manager Aviation Sales, Esso Standard Oil Co., New York City.*

Misidentified B-66

To the Editor:

In reading your March 11 issue, on page 53 the bottom picture was labeled "Latest model of Douglas B-66 . . ." The picture, as you no doubt know by now, was in error. The picture immediately above this picture was the B-66 and the caption under the picture



was labeled "Last of 3,180 Douglas AD Sky Raiders . . .," the obverse order of these captions is true. This is my first opportunity to criticize your magazine and I appreciate it greatly and thought that this would be an excellent opportunity (and excuse) to write you expressing my appreciation. *J. P. LINZ, Engine Maintenance Analyst, Technical Publications, Aircraft Gas Turbine Div., General Electric Co., Cincinnati.*

Editor's note: Reader Linz is correct; the right caption was on the wrong picture.

Air traffic controller's view

To the Editor:

Just finished reading your editorial in the March 11 issue entitled "Crisis for Air Traffic Controllers" and as a member of that oft-frustrated group I say bravo! Sam Saint, in his article on page 99, again hit the nail on the head—near misses, poor communications and obsolete control systems.

In this new fiscal year more funds were allocated to the CAA than ever before in its history, and also at about the same time the Civil Service Commission issued its downgrading directive. Gentlemen, all the new and additional navigational aids and additional radar facilities are not going to do one single bit of good without the trained personnel to man them.

Sure we feel dedicated; we know our job is important and we like our profession, but we too have families to support. So, until the CAA field personnel are taken out of the GS-5 and GS-6 level ($3,670 and $4,080 per annum), our turnover is going to continue; and until our job advancement opportunities are increased and until we are given decent tools to work with, we are going to keep on losing men—particularly the younger men.

Being government personnel, we are restricted, and justly so, in the amount of activity we can participate in. The

(Continued on page 14)

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The case for ELAND conversion

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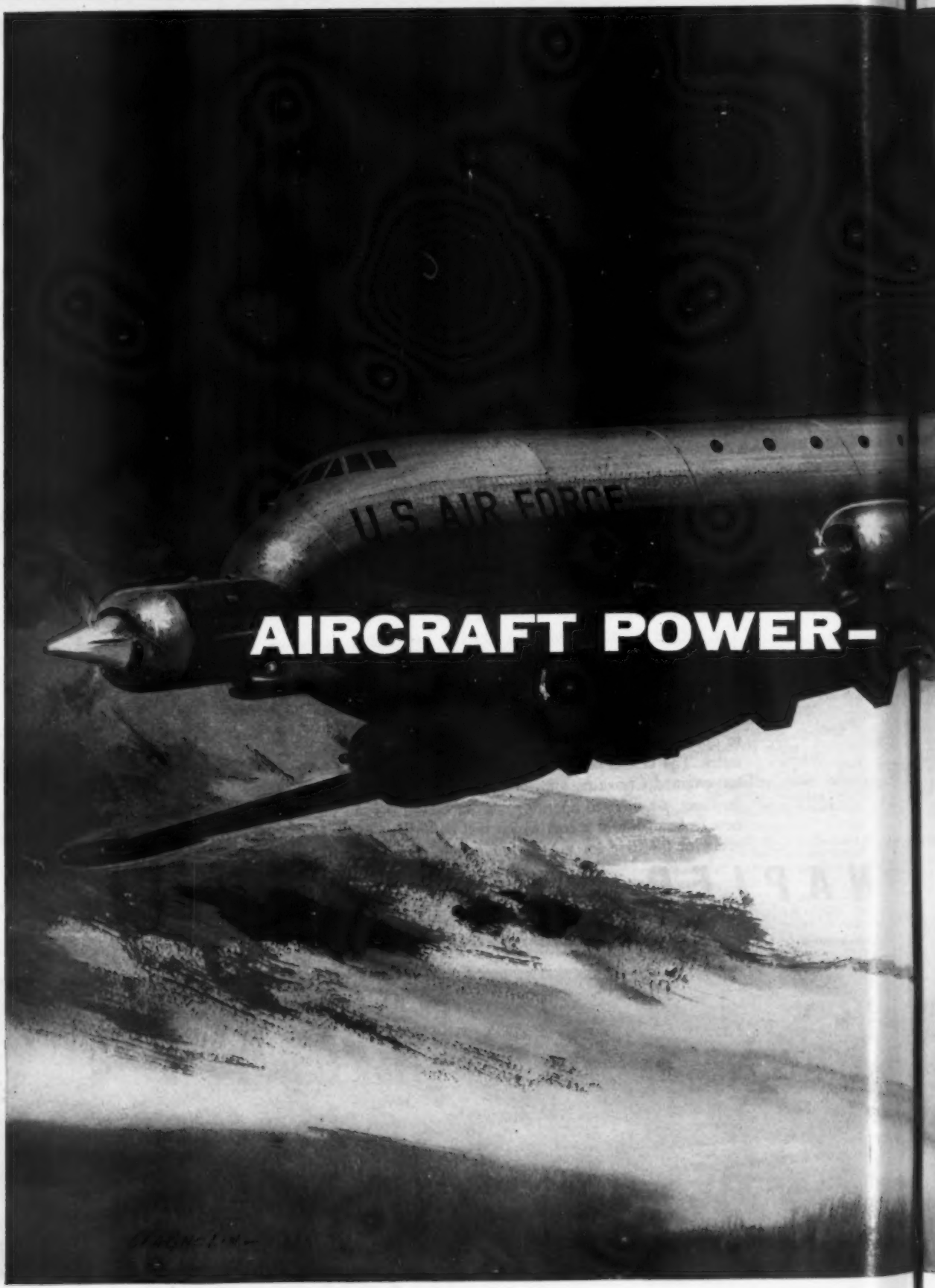
Three examples of successful Napier Eland conversions: the Convair 340, the Elizabethan, the Varsity.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in whatever form it takes

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Operating in the nose of this modified Douglas C-124 test bed aircraft, for example, is the Pratt & Whitney Aircraft T-57 propeller turbine. A major advance in its field, the T-57 combines a power potential never before realized in a propeller turbine with many operating advantages for efficient, long-range flight. Power plants with these capabilities are required for giant aircraft still under development.

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Clary Corporation,
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(illustrated above, top to bottom)

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Manufacturer of business machines, data-handling equipment, aircraft and missile components

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LETTERS

(Continued from page 10)

much-needed hollering is going to have to be done by the men who fly—all of them. And we hope you holler loud. *HOWARD C. WARNER, Baltimore, Md.*

Yeah, how about Little Rhody?

To the Editor:

Re your *En Route* in the March 25 issue: Is Rhode Island no longer a state? You have made every stop on American and Northeast. Yet you do not list R.I. as one of the states in which you have covered all airports. I believe Providence is all of the airline stops in that beautiful state. *BURTON K. PATRICK, Captain, American Airlines, Chicago.*

Editor's note: It was on Northwest, not Northeast, that all stops have been covered. Five remain on NEA, including the airport at Pawtucket, R.I., which NEA serves instead of Providence. So there's one to go in Little Rhody, which admittedly is a beautiful state.

Courtesy and consideration

To the Editor:

Sincere thanks for rehashing "Unfunny Incident" (AMERICAN AVIATION, March 25, p. 7). I concur that it takes more than regulations to control safe air traffic. Courtesy and consideration for others, regardless of size, goes a long way in preventing accidents. *LT. LOUIS C. ELLIS (USNR), Washington, D. C.*

Facts on jet deafness

To the Editor:

May I add a belated thanks and congratulations for the excellent story "Facts belie wild charges of jet deafness" in the February 25 issue (page 29). I suppose this is going to continue to be a public relations problem for every manufacturer concerned with jets for some little time, but certainly articles such as yours will help to clarify public thinking and certainly thinking within the industry . . .

We have made good use of the article in circulating it here, and I know that the Boeing News plans a series of quotes from it, crediting AMERICAN AVIATION, of course! *ROBERT S. MANSFIELD, Assistant Manager, Public Relations, Boeing Airplane Co., Seattle, Wash.*

For the record

To the Editor:

I read in the March 25 issue of AMERICAN AVIATION the article regarding Mohawk's pilot qualification by visual means (p. 63).

As a matter of information only, Lake Central Airlines used color movies with magnetic sound narration to qualify their pilots into Marion, Ind., prior to Sept. 1, 1956.

Since that time I have completed films on the airports at Erie, Toledo, Detroit and Portsmouth, Ohio. I am at present compiling a film on Buffalo, N.Y.

Although I take color slides along with movies to use for discussion purposes, I feel that movies provide a more convincing picture. My films consist of en route procedures, VFR and IFR mile-

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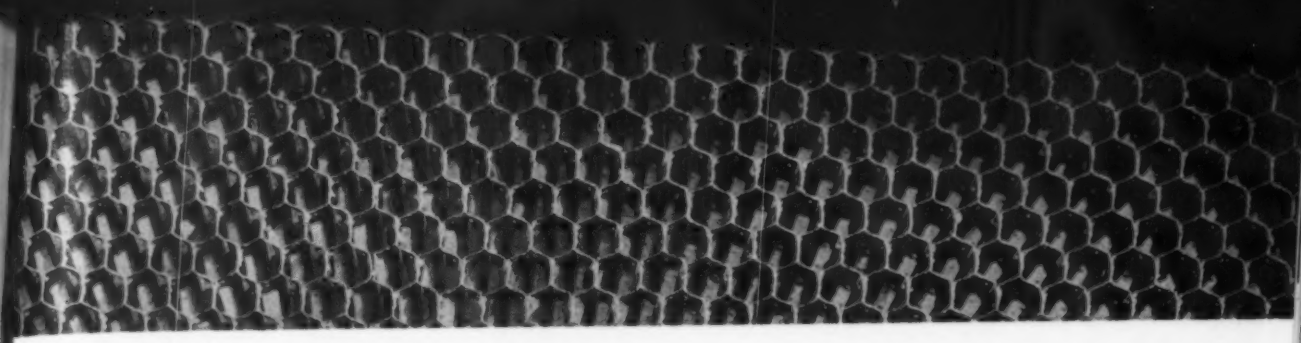


Here's NEWS *of importance to you!*

Swedlow ACQUIRES HONEYCOMB STRUCTURES COMPANY!

Giving you a reliable source for aluminum honeycomb cores and fabricated parts...

Swedlow Plastics Company is pleased to announce the recent acquisition of controlling interest in the assets, engineering and manufacturing facilities, techniques, and patents of Honeycomb Structures Company, Inc. of Los Angeles. Existing facilities will be retained, improved, and expanded.

The addition of honeycomb structural materials to Swedlow's decorative and industrial laminated plastics and heat resistant materials is a natural development and opens new fields for these interesting materials that are being used to an ever expanding degree by industry.

Sale of honeycomb core material will be handled by a newly formed "Core Division", and the sale of fabricated parts by the "Bonded Structures Division" of Swedlow Plastics Company. This now puts the combined engineering services of Swedlow and the former Honeycomb Structures Company at your disposal.

We welcome your inquiry on specific applications for these new materials.

Swedlow aluminum honeycomb material is available in a variety of core designs, sizes & thicknesses for applications such as...

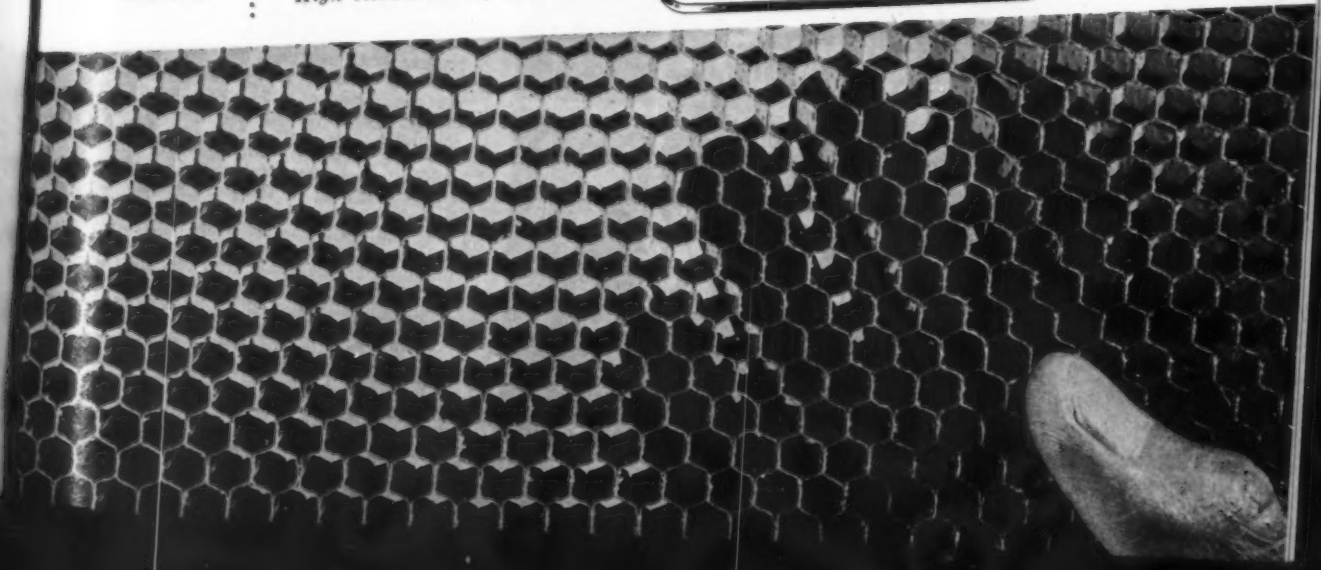
- Partition Panelling
- Flooring
- Stabilizers
- Missile Fins
- Tow Targets
- Tail Assemblies
- Ducting
- Pressurized Tanks
- Radar Vans
- Microwave Reflectors
- Electronic Gear Housings
- Heat Exchangers
- etc.

Advantages of honeycomb structural materials

- *High strength-weight ratio*
- *High rigidity-weight ratio*
- *Good thermal resistance*
- *High fatigue resistance*
- *Good acoustical insulation*
- *High vibration-damping properties*

Swedlow
PLASTICS COMPANY

Los Angeles, California
Youngstown, Ohio
Please refer to Dept. 11

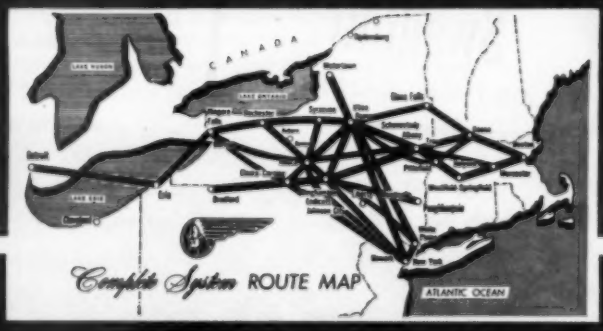


MOHAWK MOVES AHEAD...
GROWS 27% EVERY YEAR!

Right now MOHAWK's Convair Fleet is undergoing modification to a 46-seat configuration . . . to become the most attractive and productive short-haul fleet available. This will assure a continuance of our rate of passenger growth which has resulted from public need for and acceptance of MOHAWK service! In 1956 MOHAWK added Erie and Detroit on the west, and Glens Falls, N.Y., on the Boston route . . . in 1957 non-stop service will start between Syracuse and New York City!

NEXT YEAR OUR FINE NEW HEADQUARTERS BUILDING OPENS

at the Oneida County Airport between Utica and Rome, New York — expected to be the most efficient of the modern airline maintenance plants. MOHAWK moves ahead with other scheduled airlines in one of the world's great industries!



MOHAWK
AIRLINES

The Route of the Air Chiefs

EXECUTIVE OFFICES: UTICA, NEW YORK

LETTERS

ages and courses, terrain features, weather characteristics for the area, radio navigational aids, obstruction details, and detailed scenes of the airport layout.

Actual passes are made at the runways with special emphasis placed on the instrument runways.

Animation is used to show a cross-section of the instrument approaches as well as preferential IFR routing, etc. After the editing is completed, the narration is taped to assure that each pilot receives the same thorough briefing. Each pilot is required to make a simulated approach at each new airport and pass a written exam of subjects covered in the film before being signed off as qualified . . . *DONALD E. FRYE, Supervisor of Training, Lake Central Airlines, Indianapolis, Ind.*

About time, he says

To the Editor:

I read your article on no-shows and over-sales in the February 25 issue of AMERICAN AVIATION (p. 76) with great interest, since along with many other air travelers I have been a victim of over-sales.

You would certainly be doing the traveling public a great service if you would name the airlines which give the first people through the gate the seats regardless of when they purchase their tickets.

I for one would avoid those airlines when possible.

Most of us who travel on business have to keep to a fairly rigid schedule. Weather hazards are bad enough without adding a man-made obstacle. *WALTER D. SILCOX, Eaton & Howard, Inc.* Boston, Mass.

On selecting new airliners

To the Editor:

Your March 11 story on Trans-Canada Airlines was a most illuminating look into how a modern airline ap-

proaches its new equipment problems. It should go quite a ways towards spreading the message that selection of new airliners is becoming more and more scientific.

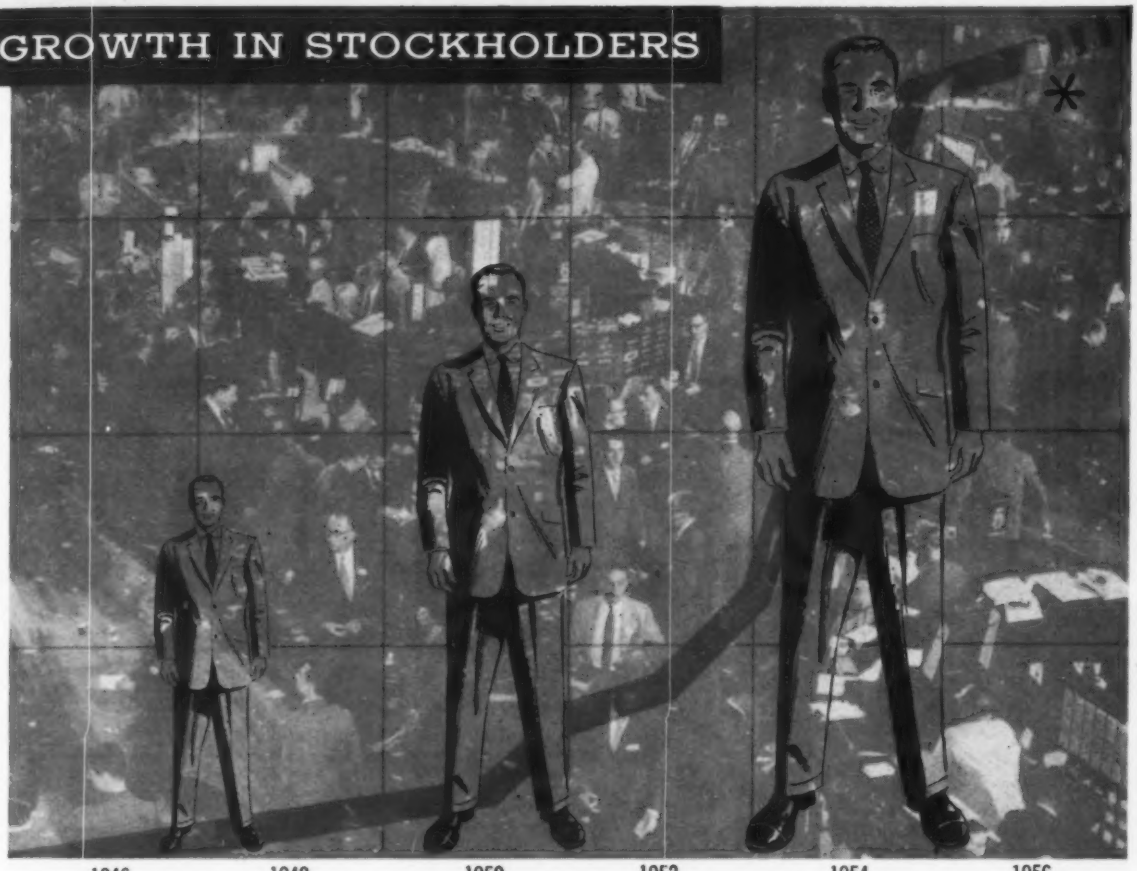
This is in line with ideas Lockheed's publicity has been trying to get across. I was delighted to see it so lucidly and logically treated by you . . .

You did a fine job. I appreciate your pointing out that, for other airlines' conditions, other aircraft may be the best choices. That is so true. There is every indication that past and future sales developments bear this out.

We like the magazine's new look—spritely, much more modern and inviting. *RICHARD L. BEAN, Public Relations Manager, Lockheed Aircraft Corp., Burbank, Calif.*

IN ENGINEERING THE BEST OPPORTUNITIES ARE IN AVIATION • IN AVIATION THE BEST OPPORTUNITIES ARE AT TEMCO

GROWTH IN STOCKHOLDERS



* Excludes approximately 3,500 additional shareholders who carried their stock in "street names"

At Temco GROWTH tells the story

Growth — in Temco's family of stockholders, for example, tells the Temco success story.

By the end of 1946 — Temco's first full year of operation — 125 investors had bought stock in the company. In just five years, that number increased 1,044 percent. By 1955, when Temco stock was first traded on the New York Stock Exchange, the number was 6,605.

The number continues to grow. Today, more than 10,000 stockholders have confidently invested in Temco's future.

This rapid increase in its family of stockholders is another measurement of the growth that is opening up exciting career opportunities at Temco. New developments in aircraft, missiles and weapons systems require an ever-widening range of engineering skills.

If you seek the challenge of a growing organization, the prestige of a soundly established company, you will find *your* opportunity at Temco.

TEMCO
AIRCRAFT CORPORATION, DALLAS

Mr. Joe Russell, Engineering Personnel
Room 104-G, Temco Aircraft Corp., Dallas, Texas

Please send me complete details of the Temco story of unusual opportunities for creative engineers. I am especially interested in _____

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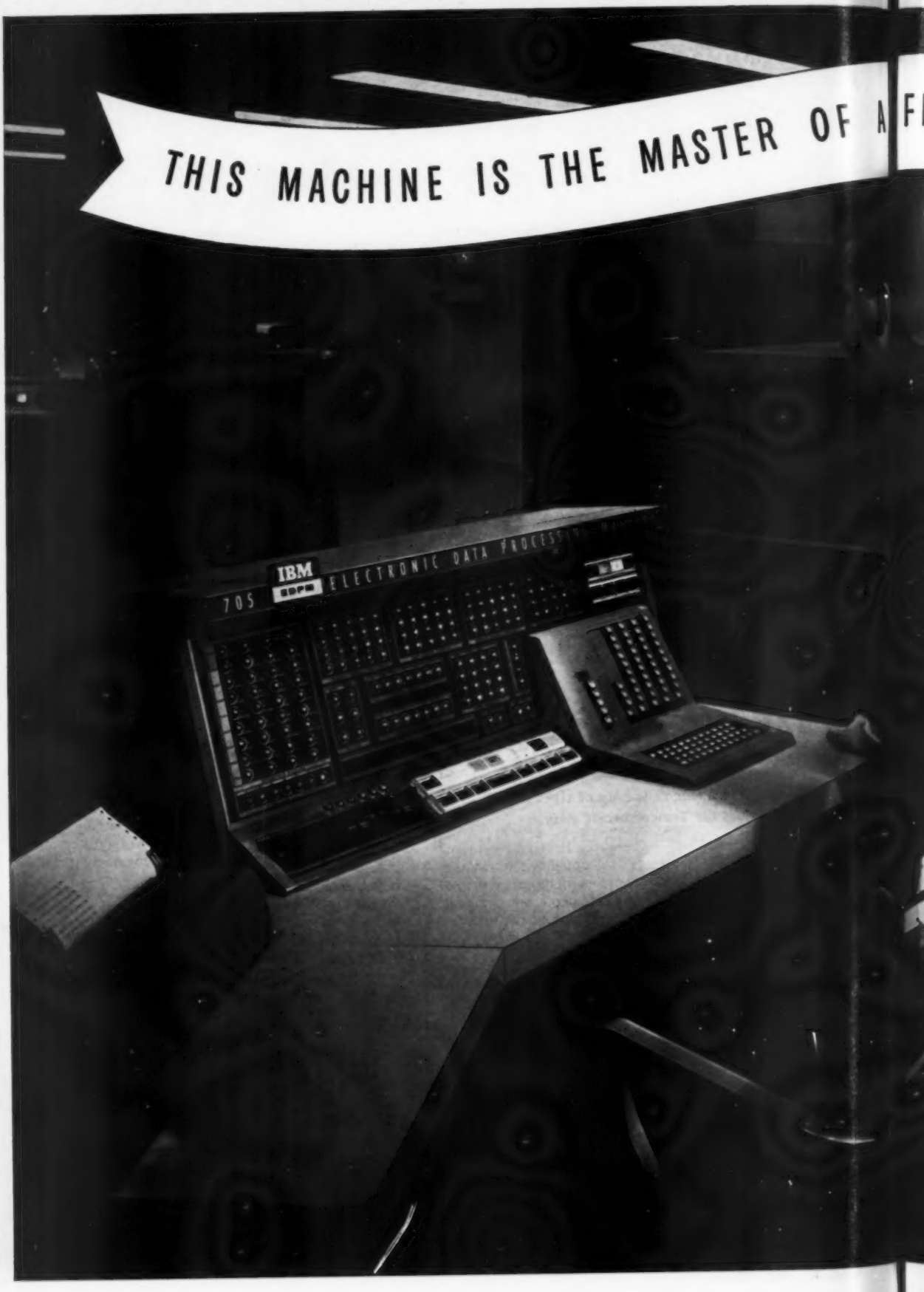
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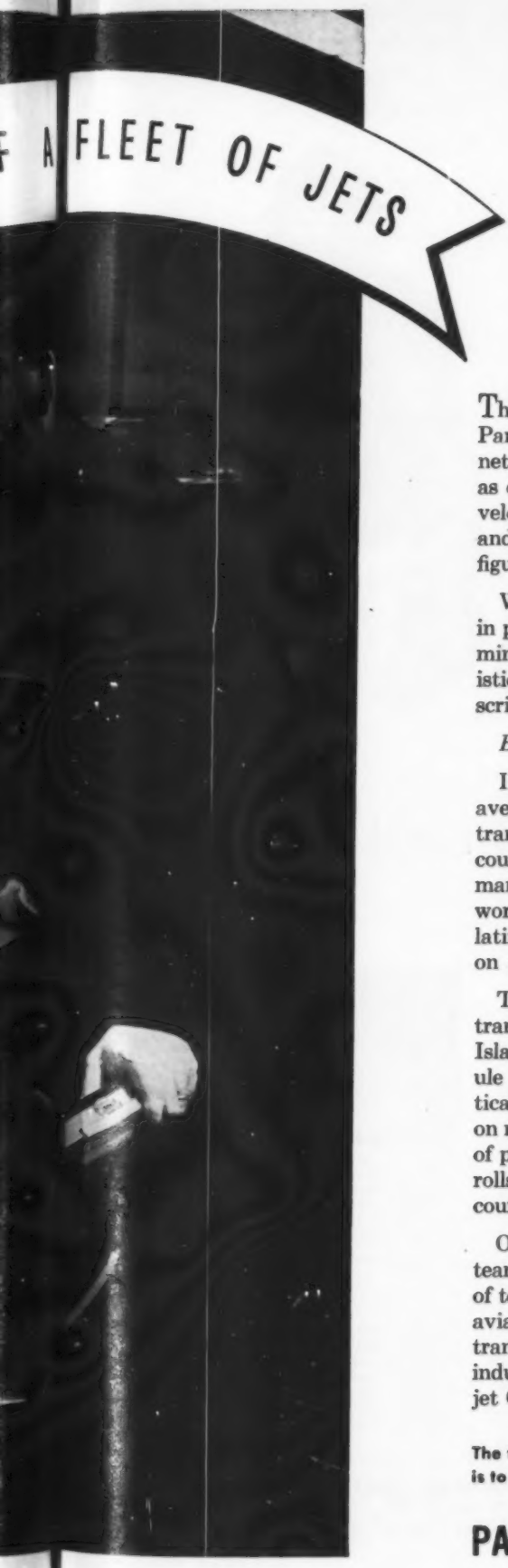

The time is drawing near when Pan American will inaugurate commercial jet service. But even now, with the aid of Pan Am's IBM 705 electronic data-processing center, the jets are already "flying."

The fabulous 705 simulates jet-age operations along Pan Am's 64,085 world-wide route miles—right now. Magnetic tapes feed into the electronic wizard such information as distance between cities, cruising speeds, altitudes, wind velocities, airport elevations, runway lengths, fuel prices and dozens of other variables—and out come the crucial figures on revenue ton-mile costs, in 120-column tabulations.

With this computer the key characteristics of any plane in production or on the drawing boards can be projected in minutes against actual operating conditions. The characteristics of the Boeing Jet Clipper*, for instance, can be described on 69 IBM punch cards.

But the 705 has present-day applications as well.

In its 'round-the-world operations, Pan American, in an average working day, handles 10,000 reservations. They are translated into not just ordinary stubs but intricate flight coupons that often encompass the globe and involve as many as 50 flight segments on as many carriers. The paper work can be imagined in terms of 15 million standard tabulating cards—with the 705 their information can be contained on a dozen magnetic tape reels, 10½ inches in diameter.

This machine, the first of its kind to be operating in the transportation field, has been installed in Pan Am's Long Island City offices. The 705 is on a full 24-hour-a-day schedule grinding out information otherwise physically impractical to obtain. The electronic brain keeps a sensitive finger on movements of international trade as reflected in the flow of passengers and cargo . . . speeds billing . . . handles payrolls . . . provides precise control of inventory . . . and, of course, manages accounting paper work.

Operations, maintenance, purchasing, training are all teaming up to meet the challenge of the jet age. This kind of teamwork is typical of Pan American's pioneering role in aviation—past, present and future. Determined to make the transition to the jets a smooth one for the public and the industry alike, Pan American *will be ready* when the first jet Clippers are delivered.

*Trade-Mark, Reg. U. S. Pat. Off.

The first responsibility of an airline is to be a *useful* citizen,

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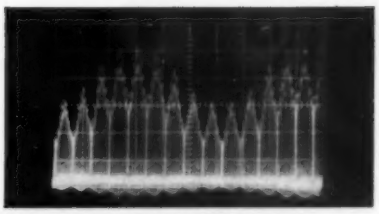
SAFE from the ground up

Hoffman Beacon Simulator bench tests TACAN-VORTAC for all-weather flying safety

The Hoffman-developed HLI-103 Beacon Simulator provides a sure, safe way to ground test airborne TACAN—and the TACAN portion of VORTAC. It duplicates the functions of a TACAN Land Beacon (AN/URN-3) and tests airborne units (AN/ARN-21) for azimuth from 0 to 360° with a ±0.2° accuracy or better, and range from 0 to 200 nautical miles with a ±0.1 mile accuracy or better. The Hoffman Beacon Simulator also tests the AN/ARN-21 at instrument airspeed from 0 to 1500 knots, land beacon identity tone and decoding functions—even simulates adverse weather conditions to assure complete operational reliability.

Hoffman TACAN-VORTAC test instruments, now used by the military services, are also available to aircraft manufacturers, commercial airlines and service operators to provide a vital, extra measure of flying safety for air navigation equipment *from the ground up*. Additional information will be promptly sent upon request.



Hoffman HLI-103 simulates the functions of TACAN Land Beacons. Photo shows 135 cps and 15 cps pulse burst detail. Phase relationships indicate surface beacon is due east of aircraft. Comparison of input settings with TACAN dial readings determines operational accuracy.

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BEACON SIMULATOR

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WHEN-WHERE

APRIL

OX5 Club, national meeting, Municipal Airport, Norwood, Mass., Apr. 25.

Airport Operators Council, Conrad Hilton Hotel, Chicago, Apr. 28-May 2.

Flight Test Instrumentation Symposium, Statler Hotel, Los Angeles, Apr. 29-May 2.

Society of Aeronautical Weight Engineers, annual national conference, Broadview Hotel, Wichita, Kans., Apr. 29-May 2.

National Materials Handling Exposition, Convention Hall, Philadelphia, Apr. 29-May 3.

MAY

Society for Experimental Stress Analysis, spring meeting and exhibit, Hotel Statler, Boston, Mass., May 1-3.

Aeronautical Training Society, annual meeting, Mayflower Hotel, Washington, D.C., May 2-3.

Aviation Education Conference, sponsored by California Aviation Education Assn., San Jose State College, San Jose, Calif., May 3-5.

American Assn. of Airport Executives, annual convention. Shamrock-Hilton Hotel, Houston, Tex., May 5-8.

Aero Medical Assn., 28th annual meeting, Shirley Savoy Hotel, Denver, Colo., May 6-8.

IRE and Radio Technical Commission for Aeronautics, spring meeting, Ambassador Hotel, Los Angeles, May 7-9.

American Helicopter Society, annual national forum, Sheraton-Park Hotel, Washington, D.C., May 8-11.

Aeronautical Electronics Conference, sponsored by the Institute of Radio Engineers, Biltmore Hotel, Dayton, May 13-15.

American Society of Civil Engineers, Jet Age Airport Conference, Park-Sheraton Hotel, New York, May 15-17.

American Institute of Industrial Engineers, 8th annual conference and convention, Hotel Statler, New York City, May 16-18.

Armed Forces Day "Open House" at most U.S. Military Bases, May 18.

Armed Forces Communications and Electronics Assn., convention, Sheraton-Park Hotel, Washington, D.C., May 20-22.

Design Engineering Conference of American Society of Mechanical Engineers, Coliseum, New York, May 20-23.

National Fire Protection Assn., annual aviation fire safety seminar, Hotel Statler, Los Angeles, May 20-24.

International Air Show, Le Bourget Airport, Paris, May 24-June 2.

Aviation Writers Assn., annual convention, Chase and Park-Plaza Hotels, St. Louis, May 26-June 2.

JUNE

Reading Aviation Service 8th annual Maintenance and Operations meeting, Municipal Airport, Reading, Pa., June 1.

National Aviation Trades Show, Monmouth County Airport, N. J., June 1-9.

Parks College annual homecoming and reunion, East St. Louis, Ill. June 7-8.

ASME semi-annual meeting, Sheraton-Palace Hotel, San Francisco, June 9-13.

the shape of wings to come...

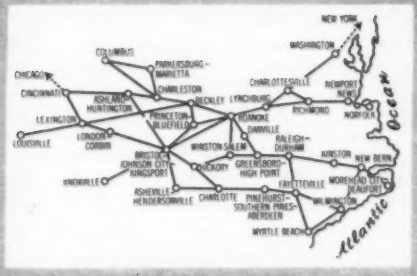
on PIEDMONT AIRLINES

There'll soon be new sights . . . and new sounds . . . in the skies along Piedmont Airlines' Route of the Pacemakers!

Early in 1958, new F-27 Pacemakers are scheduled to go into service on the Piedmont system. Twelve of these splendid planes—manufactured by Fairchild and powered by world-famous Rolls-Royce prop-jet engines—have been ordered by Piedmont and 12 more optioned.

These distinctively beautiful, high-winged transports will usher the age of propeller turbine air travel into the majority of the 50 cities—large and small—served by Piedmont.

The silhouette of the F-27—"the shape of wings to come"—exemplifies Piedmont Airlines' faith in the future and its determination to provide the finest and most modern air transportation available.



PIEDMONT AIRLINES

HOME OFFICE AND OPERATIONS BASE—SMITH REYNOLDS AIRPORT
WINSTON-SALEM, NORTH CAROLINA

for Douglas' new DC-8...

Flight Control System—by Sperry

Precise as automatic flight control systems are for today's conventional aircraft, even more precise systems are required for tomorrow's new multi-jet and turbo-prop transports. These planes demand exact control between landing and sonic speeds . . . at varying altitudes . . . and over great distances.

To meet all the precise requirements of these aircraft, Sperry has engineered an entirely new concept in flight control systems, the SP-30. Working with Douglas design engineers, Sperry has integrated the SP-30 system with the DC-8 for optimum flying efficiency. For *passenger comfort,* this system features closer and faster-acting control in all modes and at all speeds, helping to provide a smooth and comfortable ride. *Accurate navigation* over all regions, including polar areas, is achieved through an extremely accurate compass system integrated into the SP-30. And for *maximum dependability,* advanced design elements include redundant circuits, transistors, and magnetic amplifiers which drive servo motors directly. *Faster, easier maintenance* is provided by "plug-in" components.

PERCY HALPERT, Chief Engineer of our Aeronautical Equipment Division and 20-year Sperry veteran. Serving aviation—he has over 25 important patents on automatic flight controls.

Assisting the pilots of new jet-age aircraft to stay on course and on schedule is an assignment that Sperry is notably qualified to handle. The evidence is clear—thousands of Sperry automatic flight control systems are on the job today aboard multi-jet military aircraft.

Whatever the flight control problem, you'll find Sperry engineers eminently qualified to help you. Write our Aeronautical Equipment Division.

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Model 345

For Cockpit Installation

26 Pounds Total Weight

Compact scope and command control designed for cockpit installation. 34-tube receiver (not shown) occupies ¾ ATR rack.

Now, the long-awaited aircraft loran, designed primarily to fill the needs of transoceanic flying and packaged for cockpit installation, is announced by EDO. Built specifically to meet airline requirements, this new lightweight unit is designed for instrument panel mounting, convenient to the pilot.

It's no longer necessary to pay a heavy weight penalty for the added safety and convenience of loran gear. Edo's new set weighs only 26 pounds completely installed.

Built to the highest electronic standards, the Edo Model 345 gives quick, directly read time difference readings for accurate plots in a matter of seconds. No calculation, no computations, no tables, no special training needed to operate. As simple to use as any other pilot-operated radio navigation aid.

A development of Edo's years of research, design and production of dependable marine loran sets and other high performance electronic equipment, the Model 345 contains the latest miniaturized circuitry. Its compact remote control console and clear, easily read 3-inch scope fit neatly into the restricted space of an airplane instrument panel.

If you are interested in detailed specifications and operating data, please write for particulars.

FEATURES OF THE EDO MODEL 345

- **3-inch scope easily read even under bright light conditions. Does not require a special hood. Can be mounted directly in instrument panel, or other accessible spot.**
- **Pilot-operated command control gives directly read solution to problem. No calculations, no tables, no special training needed to operate.**
- **Loran receiver containing 34 tubes. Features low power consumption — only 175 watts, 115 v 400 cycles; 25 watts, 24 v DC.**
- **No-drift signal assured by special oscillator control.**
- **Highly accurate voltage regulation for dependable operation.**
- **Complete fail-safe feature.**

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Manufacturers of

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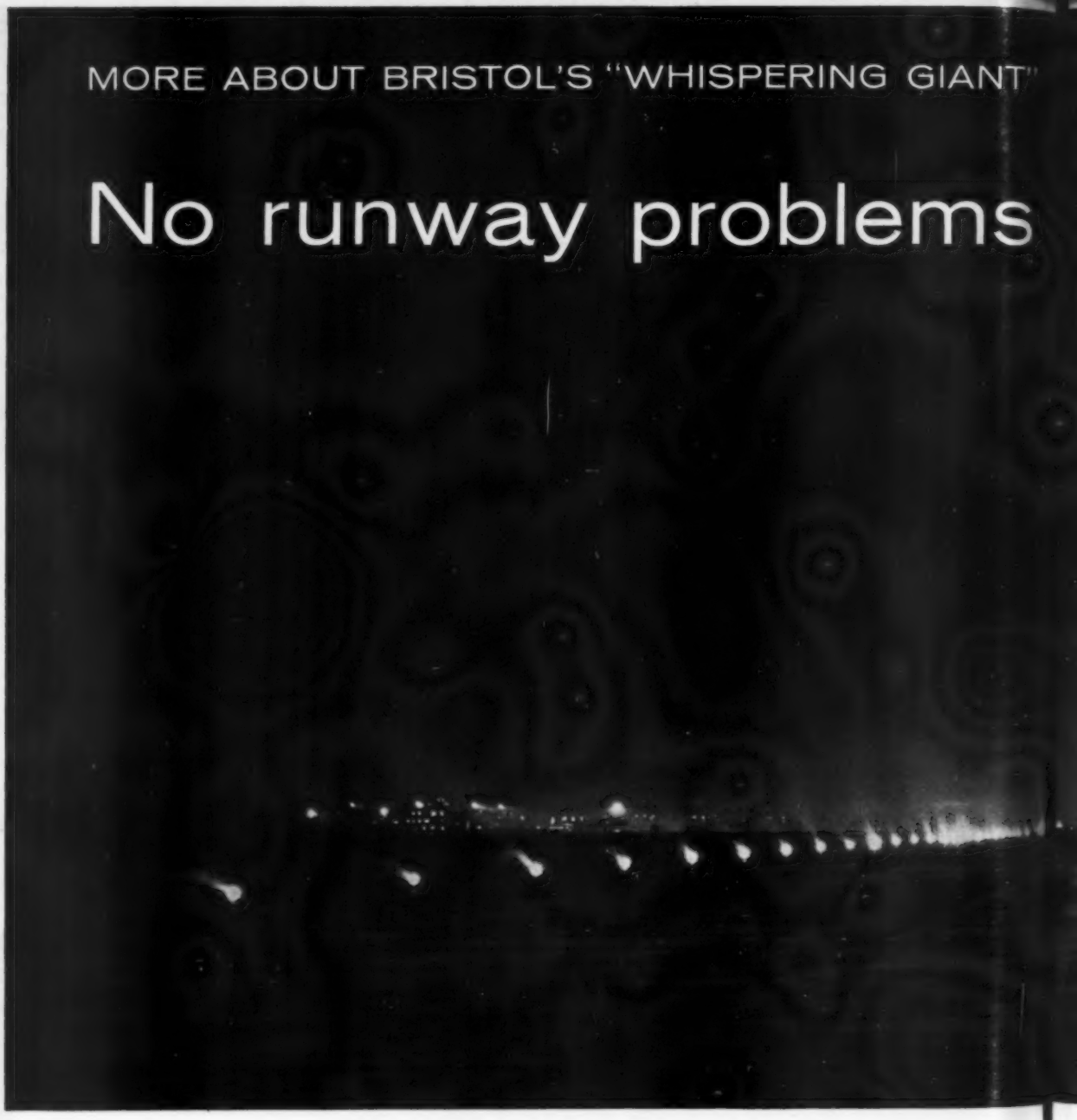
No runway problems



The brilliant new Bristol Britannia is the world's largest, fastest turboprop airliner ... yet operates from existing runways throughout the world.

FROM a 6,000-ft. runway, she will lift a 28,000-lb. payload plus enough fuel for a sector distance of 2,500 miles, with full allowances and reserves.

The Britannia is powered by four 4,120 horsepower Bristol Proteus engines, cruises at 400 m.p.h., carries up to 133 passengers at amazingly low operating costs.

She is the world's most versatile airliner because she maintains her matchless standards of efficiency and economy on an extremely wide variety of stage-lengths ... on routes ranging from 5,500 right down to 200 miles.

On all counts, the Britannia is years ahead of any other passenger aircraft.

She is now in commercial service with British Overseas Airways Corporation. Britannias have also been ordered by Northeast Airlines, Canadian Pacific Airlines, El Al Israel Airlines, Hunting-Clan Air Transport, The Royal Air Force and The British Ministry of Supply.

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Britannia

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SPOTLIGHT

Lockheed is readying a proposal to Air Force for an advanced version of its F-104A fighter/interceptor having all-weather capabilities plus increased range. USAF officials are expected to review the design sometime next month. Big factor behind any decision to go ahead with new model will be based on how much of a speed sacrifice will be necessary to get increased range and all-weather potential.

Unannounced orders for two additional DC-8s raises Douglas jet transport sales total to 124. It has also scheduled a 125th airplane for its own use, but this presumably will be sold for delivery once flight testing and certification are completed.

Flight trials are underway on two new British designs. Short Bros. & Harland's SC-1 VTOL jet-lifter is being evaluated as a conventional airplane to prove its normal handling characteristics. First of three English Electric P.1B supersonic fighters is also under test. Total of 20 pre-production models are to be built. P.1B is considered Britain's last manned fighter before air defense transition to missiles.

Prospects of a big new market in so-called "zip" fuels are attracting major oil companies to the field. Gulf Oil Corp. has bought a 25% share of Callery Chemical Co. from its Parent Minex Safety Appliance Co. of Pittsburgh. Callery will operate a $38-million boron fuel plant for Navy at Muskogee, Okla., while Olin Mathieson Chemical Corp. is building a similar $36-million plant for Air Force at Niagara Falls, N.Y.

Breguet 1,100 lightweight fighter made its first flight on March 31. French-British HDM 105 transport also has started flight testing. Latter design is a Miles Aerovan fuselage fitted with a Hurel-Dubois high aspect ratio wing. Conversion was made by Miles plant at Shoreham, England.

Tentative production schedule at Cessna Aircraft Co. for its Air Force T-37A jet trainer is to turn out 17 planes per month by July. This assumes no further delays in program. Small jet trainer reportedly has been handicapped since early development stages by engine problems, most recent of which resulted in temporary grounding. Cessna currently has contracts totaling $48.5 million for T-37A, with follow-on orders in the offing from fiscal 1958 funds.

Douglas studies on a turboprop version of the DC-7C show the aircraft would gross 170,000 lbs. in an all-cargo version, or 146,000 lbs. for passenger operation. The project, which would be the DC-7D, would involve a fuselage stretch and a revision of the DC-7C's tail. Powerplant used by Douglas in its studies is the Rolls-Royce Tyne.

One U.S. airline equipped for international flight reports cost of electronics in the DC-6/7 series is $61,000 and the DC-8 is $95,500. Installation costs are reported as $19,500 and $25,250 over and above purchase price.

British manufacturers of airborne electronics gear have decided not to hold out on maintaining their own package form factor. They have begun transition to Arinc compatible standards. Recent decision of six European airlines to coordinate their requirements based on U.S. standards could have triggered the move.

Biggest DC-3 operator in the U.S., probably in the world, is North Central Airlines. Feeder airline last year surpassed Capital Airlines, previous holder of top spot, when it operated 55,651 flight hours and 7.9 million passenger miles.

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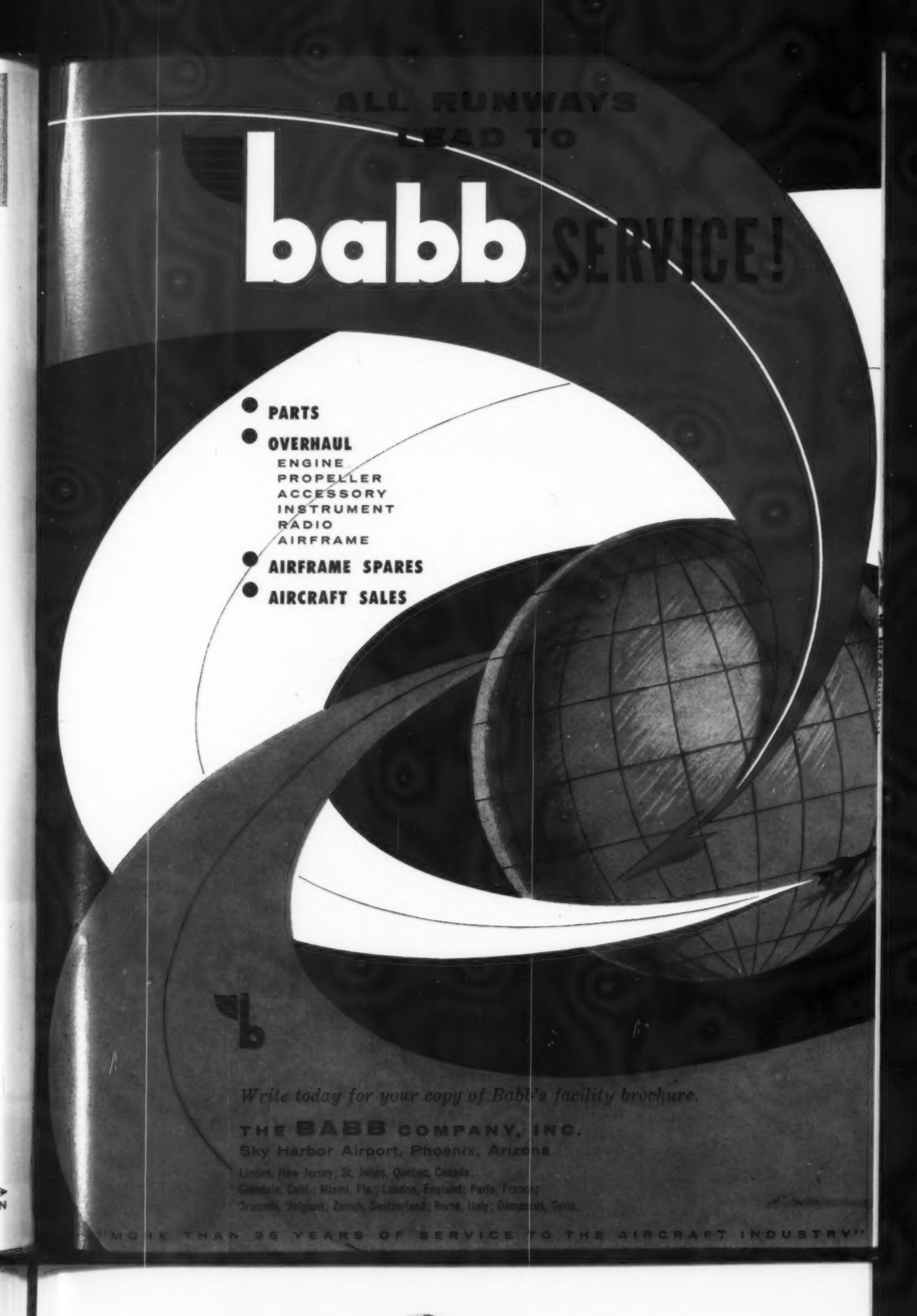

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"MORE THAN 36 YEARS OF SERVICE TO THE AIRCRAFT INDUSTRY"

The new pride of Eastern . . .
PROTECTED BY SINCLAIR

Latest Eastern Air Lines plane to bear the illustrious Golden Falcon name is the Super G Constellation. This new titan of the skies carries 70 passengers – has an increased cruising range and includes 107 new design features. It embodies new luxury, style and comfort – retains its traditional dolphin-like grace and triple tail.

Its four great Turbo Compound engines that generate 13 thousand horsepower are protected with Sinclair Aircraft Oil. Eastern uses Sinclair Aircraft Oil *exclusively* because of its proved quality and dependability over the years. In fact, today 45% of the aircraft oil used by major scheduled airlines in the U.S. is supplied by Sinclair. There's no better proof of reliability.

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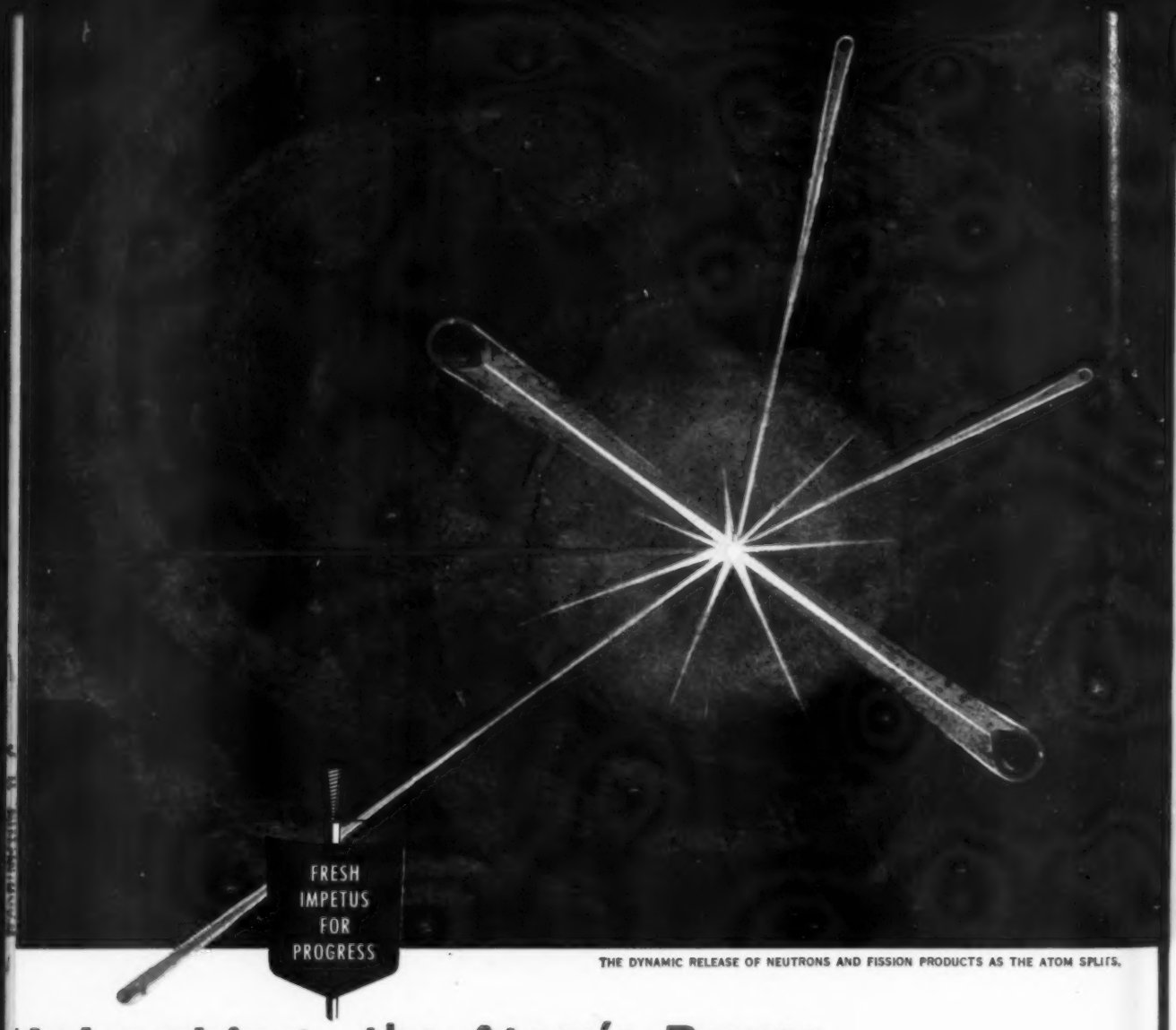
N6235G
SUPER-G



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WORLD'S LARGEST AVIATION PUBLISHERS

AMERICAN AVIATION

Profits shrink . . .

Sharp decline in net operating income poses threat to jet-age financing

by William V. Henzey

THE COLD LOGIC of the disappearing dollar—29 million of them in fact—will lead airline management this year to apply the financial brakes to what heretofore has been a full-speed-ahead drive into the age of jet propulsion and mass coach transportation.

The decision will be made without pessimism on the question of whether the industry can fulfill its dedication to one of the greatest modernization programs in American industrial history. But it will reflect vital concern over whether the program will be carried through by a healthy, soundly-financed and self-sustained industry or by one mortgaged beyond the bounds of good business.

Some responsible and sincere critics treat recent arguments of increasing airline cost and static fare levels as counter-phychology to threats of a Government-enforced fare cut. But the real fact is that the domestic trunk lines' net operating income—the difference between revenues and expenses—took its biggest single-year drop in history in 1956, plummeting to $101 million from the 1955 figure of $129.7 million.

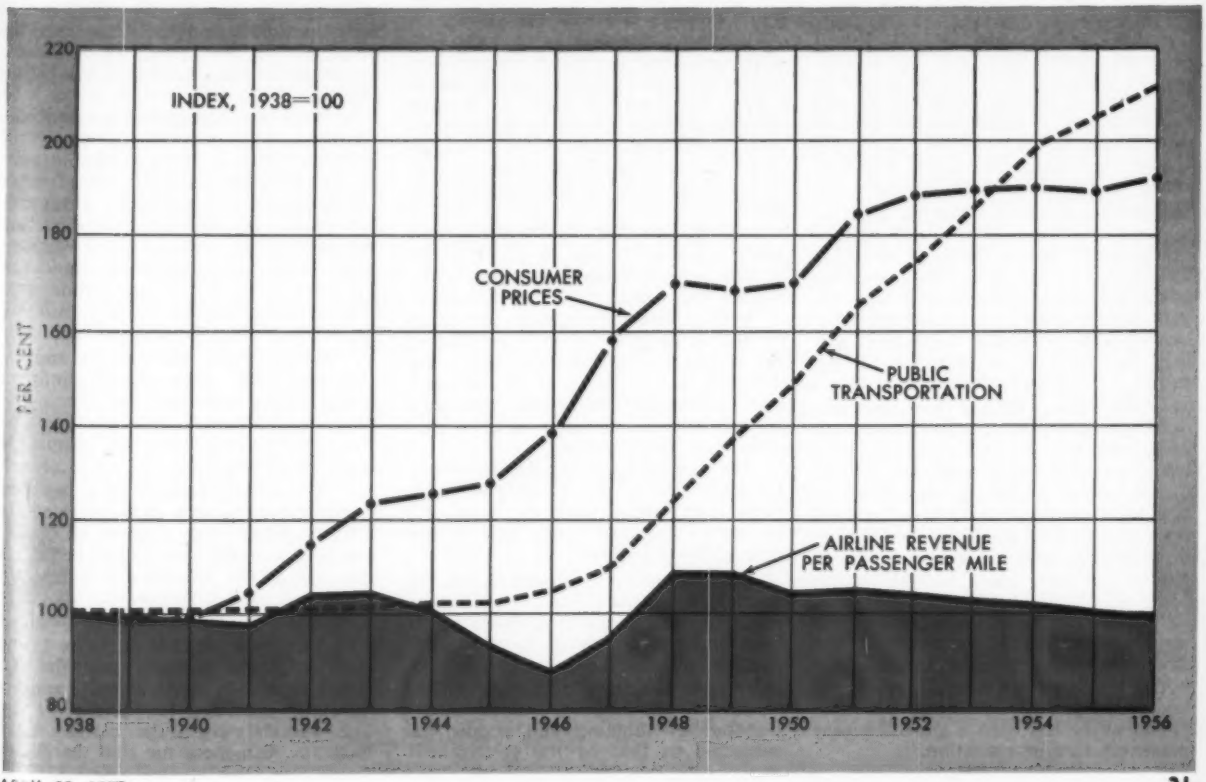
Expenses outdistanced revenues

Key factor in such a drop is that operating expenses rose $162 million last year while revenues increased but $134.7 million. Thus, if the cost of today's operations eat up the revenue originally earmarked for tomorrow's jets, the problem facing the industry is clear.

The last time the industry's operating income stopped climbing was in 1952 when it skidded some $9 million from the previous year. In 1953 it dropped off another $7 million. Significantly, last year's tailspin left total earnings less than accumulated by the industry in 1951. For an industry that recently committed itself to a $2½ billion re-equipment program, the earnings trend is definitely in reverse.

Individually among the carriers, it is significant that three suffered operating losses last year whereas none of the trunklines were in the red the previous year. Trans World Airlines, which recently laid off 10% or some 2,000 of its employes, dropped from a $10 million operating income in 1955 to a $3.4 million loss in 1956.

Capital Airlines switched from a 1955 income of $494,000 to a 1956 operating loss of $2.8 million. North-



east Airlines, which expects to wipe out past deficits with its New York-Miami run, nevertheless dropped from a $1.1 million operating income in 1955 to a $428,000 loss last year.

Five other trunks realized less operating income last year although still showing a profit and the remaining four enjoyed such a minor income rise that it stands to be erased this year by the recent fuel cost increase.

Decision up to industry

It is in this atmosphere that industry, faced with a virtual public mandate to finance and produce a jet fleet, must make the decision between retrenchment or higher prices to the public. If present unfavorable trends continue, both retrenchment and higher prices may be necessary.

On the other side of the coin is the responsibile Federal regulatory body, the Civil Aeronautics Board, bound by political and policy ties which prevent immediate objective consideration of the industry's economic troubles.

In fact, while the airlines seek to solve their money problems, CAB is committed to a program which compounds those problems. The regulated and the regulator are going in opposite directions.

To understand CAB's side, it is necessary to go back first to 1953. The airlines sought a $1 increase in all fares. They got it but also were exposed to a general fare investigation. Much has been written of the situation that developed but suffice it to say the CAB dismissed the fare investigation on the strength of an airline policy argument that is now coming back to haunt the industry.

That policy calls for the Board to look at the so-called "long-term" picture before permitting or ordering fare changes. Excess earnings in one or two years, or minimum earnings or even losses in one or two years, the agency has held, will not be sufficient cause to upset the fare structure.

Here is CAB's precise language on that policy: ". . . it is our intent to examine any future fare . . . not only in the light of conditions prevailing at the time they are advanced but with full consideration of the abnormal earnings of prior years and the excess earnings which may be expected in the future, as indicated by such experience.

"In short, should earnings fall markedly in the future the carriers will be expected to absorb such losses without resort to fare or mail rate adjustments unless it can be demonstrated that such earnings are below the level necessary to provide a fair return over a reasonably extended period which includes the good years as well as the bad."

With that policy, advocated by the airline industry, a majority of the Board overruled arguments of a minority which were pegged (1) to alleged high earnings and (2) the argument that "there never has been a general airline passenger fare investigation."

Last year, the 1953 fare debate was resurrected by the House Antitrust Subcommittee with emphasis on the points that earnings appear excessively high and "there never has been a general airline passenger fare investigation." Some CAB officials such as Member Harmar D. Denny, one of the three-man majority in the 1953 case, and rates chief Irving Roth, attempted to justify CAB's policy on fare matters.

But CAB's top man during most of the House Subcommittee hearings—then Chairman Ross Rizley—agreed with the Subcommittee that the fare matter should be explored. Rizley left CAB during those hearings and his replacement, current Chairman James R. Durfee, appeared caught in the middle with little alternative but to issue the call for a general investigation.

In May, 1956, a formal order of investigation was issued by the Board. The tenor of the order and the background which led to it produce the clear implication that the proceeding should lead to a general fare cut.

Thus, CAB, which exists under a Congressional mandate to "foster, promote, and develop air transportation," is under another mandate from a powerful Congressional committee which calls for CAB to virtually reject the experienced judgment of the industry it is supposed to help develop.

Two years of investigation

CAB's general fare investigation has not yet reached the hearing stage and, at the present rate, will not be completed for another two years at least. In the absence of such a decision, the agency is limited in coping with interim industry financial problems.

Emphasizing that point is the situation provoked in March when seven of the nation's 12 trunklines petitioned for a 6% fare increase to become effective April 1, subject to the ultimate outcome of the general fare investigation. No one within hearing distance was surprised when CAB suspended the tariffs.

Under the Act, the suspension can apply for a maximum of 180 days or, in this case, through September, 1957. Within this time, CAB must conduct a "junior" fare investigation and come up with a decision before expiration of the suspension period. The only such decision that wouldn't be a surprise is one maintaining the status quo until the general investigation is completed some two years hence.

In the parlance of the regulatory agencies, this is one CAB can "walk away from" on grounds the issues will be more thoroughly explored in the general investigation.

The situation is unique in the 19-year regulated history of U.S. air transportation. The cards have never before been the same. Prior to the 1953 episode, industry fare matters were considered in the light of the subsidized status of the airlines. Management's freedom of thinking and action was subjected to that of the government, which held the subsidy purse strings.

Typical of this distinction was a relatively unheralded development which took place in March almost simultaneously with CAB's suspension of the trunklines' 6% fare increase tariffs. The two Hawaiian Island operators—Hawaiian Airlines and Trans Pacific Airlines—proposed 10% fare increases to become effective April 1.

Both Hawaiian lines have been subsidized. They argued that additional passenger revenues from the 10% increase would eliminate the need for further subsidy. CAB promptly granted the increase.

The parallel drawn here is that CAB, in the case of the non-subsidized carriers, said it could not permit a fare increase without a formal investigation, but in the case of the subsidized lines, did so. There is no disputing the agency's action with respect to the Hawaiian lines, but there is considerable doubt over the adequacy of the machinery to cope with fare problems of all lines when independent of subsidy.

On the surface, the theory of a general fare investigation would appear to hold the answer since it envisions what Congressmen freely refer to as the "establishment of standards." Once those standards are set, subsequent fare problems presumably could be dealt with by simple application of the standard to the problem.

But the fact that both Congress and CAB must bear in mind is that the industry can not remain static while the slow-grinding machine of government tries to come up with answers.

And the doubtful application today of the policy enunciated in 1953 should serve as notice that the "standards" to come out of the current general fare investigation may be outmoded before the ink dries.

Were the accomplishments of the industry unreasonable in terms of profits and unjust to the public in terms of prices charged, there would be a prima facie case against them. But current profit margins are dropping and the substantial bulk of past earnings have been ploughed back into new equipment. The average airline passenger in 1956 paid less per mile for his air trip than he did in 1938.

Result is that the lengthy and expensive CAB proceeding continues more on the principle that "there has never been a general fare investigation" than on the fact that there should be such an investigation.

The answer may be in a top-level Government-industry meeting. Veteran CAB Member Chan Gurney, in opposing last month's suspension action in the case of the would-be 6% fare increase, phrased it this way:

"The (CAB) majority has taken a step of tremendous importance to the welfare of the industry and the national interest by summarily suspending the tariffs providing for increased rates. The material which the carriers have filed . . . convinces me that the Board

should have explored this matter more thoroughly before coming to the conclusion to suspend these tariffs."

Gurney noted industry statements that it can no longer absorb price increases as operating efficiencies have reached their peak and the rate of traffic growth is slowing down. He said the Board "would afford all the carriers involved an immediate opportunity to meet formally with the Board to state their problems briefly and concisely."

"After such a meeting," he added, "I feel that the Board would be more competent to pass on this very important matter."

Growth of coach traffic beginning to taper off, CAB figures show

Coach traffic of the domestic trunk airlines continued to grow in 1956 but the tapering off, first apparent in 1955, has now been more firmly established. For the industry as a group, coach is making no new inroads on the total air passenger market. For the second straight year, it accounted for approximately 35% of the trunks' passenger-mile totals.

Despite this apparent stability, however, the situation with respect to individual carriers is far from static.

Here is a brief resume on the coach picture for each of the trunks:

Eastern Air Lines assumed the leadership from Trans World Airlines and increased its ratio of coach to total traffic from 43.56% in 1955 to 44.31% last year.

United Air Lines, a comparatively slow-starter in the coach picture, zoomed last year to the second ranking spot in the industry and increased its coach ratio from 30.64% to 34.75%.

Trans World Airlines, perennial industry coach leader, dropped to third spot last year, as it carried less coach traffic than in 1955. For the first time since 1953, TWA dropped below the 50% coach ratio domestically. In 1956, coach gains of the first six months were wiped out by declines in each of the last six months. These trends are exclusive of TWA's transatlantic coach operations which are substantially over the 50% ratio.

American Airlines showed substantial gains in coach traffic last year and increased its ratio from 27.08% to 29.37%. But its gains were less than those of United and it dropped from third to fourth in the industry picture.

National Airlines continued far ahead of the industry in the coach ratio category and is currently the only domestic operator carrying more coach than first class traffic. Despite this unchallenged position, NAL's ratio dropped from 56.40% in 1955 to 55.18% in 1956.

Delta Air Lines jumped from seventh to sixth in industry standings and showed the greatest individual gain in coach ratio from 29.49% in 1955 to 37.41% last year.

Northwest Airlines, despite dropping below Delta in the coach passenger-mile picture, reversed a trend of recent years and showed a substantial increase in coach passenger-miles and increased its coach ratio from 35.87% to 38.44%, fourth highest in the industry.

Western Air Lines, hampered by a pilots' strike in early 1956, nevertheless held on to its eighth ranking despite less coach traffic and a drop in ratio from 33.03% in 1955 to 27.58% in 1956.

Capital Airlines' coach traffic continued to drop last year and its coach ratio dipped to 11.43%, lowest in the industry since the merger of Colonial Airlines into Eastern.

Braniff Airways increased its coach ratio from 6.59% to 12.28% and registered one of the industry's biggest percentage gains in coach traffic last year.

Continental Air Lines coach traffic continued on a gradual upswing but its ratio changed only slightly from 12.35% in 1955 to 12.46% last year.

Colonial Airlines, prior to its merger into Eastern last June, showed a slight gain in coach ratio from 7.60% to 8.15%.

Also apparent last year for the first time were local service coach statistics.

Southwest Airways, with a service originated July 20, 1956, chalked up 8.3 million passenger-miles by year end.

This year also, Northeast Airlines will contribute to the coach total by virtue of its new service between New York and Miami.

In 1956, coach traffic produced approximately $345 million in revenues for the trunks, or more than total passenger revenues of domestic lines just ten years ago.

West Coast Airlines increases F-27 orders

West Coast Airlines has increased its order for Fairchild F-27 twin-turboprops from four to six.

In making the announcement, Fairchild Aircraft and Engine Corp. said that a total of 62 firm orders for the F-27 transports has been received and a number of additional orders are in the final stages of negotiation.

Included in the latter are those reportedly placed by Canadian Pacific Airlines and an Alaskan airline for cargo-passenger versions. Northern Consolidated Airlines of Alaska has already ordered three of the combination transports.

How airlines rank in coach traffic

	Rev.-Pass.-Miles-1956			Rev.-Pass.-Miles-1955		
	(000) Total	(000) Coach	%	(000) Total	(000) Coach	%
Eastern	3,790,759	1,679,822	44.31	3,341,800	1,455,792	43.56
United	4,274,422	1,485,600	34.75	3,753,964	1,150,336	30.64
TWA	3,226,510	1,476,840	45.21	2,866,342	1,486,314	51.85
American	4,800,526	1,410,327	29.37	4,265,962	1,155,235	27.08
National	949,171	523,762	55.18	849,169	478,944	56.40
Delta	1,127,109	421,681	37.41	952,601	280,977	29.49
Northwest	872,379	335,361	38.44	823,420	295,387	35.87
Western	458,131	126,377	27.58	513,800	169,733	33.03
Capital	1,021,564	116,811	11.43	792,095	117,811	14.87
Braniff	721,617	88,621	12.28	604,674	39,906	6.59
Continental	259,595	32,357	12.46	221,223	27,344	12.35
Colonial *	39,340	3,209	8.15	103,645	7,880	7.60
Totals	21,581,123	7,700,828	35.68	19,088,775	6,665,649	34.92

**- Colonial was merged into Eastern, June, 1956. Individual figures shown for Colonial are pre-merger figures.*

Source: Figures are for domestic operations only and are taken from compilations made by the Civil Aeronautics Board from reports filed by the carriers.

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Air transport—a study in growth

IN 1947, U.S. air transportation was still a matter of 200-mph unpressurized flight. The Douglas DC-3 was the "workhorse" of airline operations. Four-engine DC-4s and Lockheed L-49s converted from World War II duty were only beginning to make their name.

Pressurized Douglas DC-6s, advanced Constellations, Convair 240s and Boeing Stratocruisers were making inaugural flights, rolling down production lines or still in earlier stages of design.

Intercontinental Air Travel was in its infancy. Since then, air transport growth has been little short of phenomenal. In the brief span of 10 years, gains in virtually every traffic category—passengers, cargo, mail and express—have been one hundred-fold, in many instances even greater.

Industry revenues have moved from the million- to the billion-dollar column. Income has turned from loss to profit.

U.S. scheduled airlines, historically a match for the rest of the free world in total operations, continued to set the pace. Year by year, these statistics continued to demonstrate the accomplishments of a dynamic industry—U.S. air transport.

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Percent increase over '47
TRAFFIC											
Revenue Passenger Miles Flown (billions)											
First Class	7.9	7.9	8.6	9.2	11.5	12.5	13.0	13.2	14.8	16.2	104
Coach	....	*	0.25	1.0	1.7	3.1	5.1	7.4	9.5	11.4	984†
Total	7.9	7.9	8.83	10.2	13.2	15.6	18.1	20.6	24.3	27.6	249
Available Seat Miles Flown (billions)	12.30	13.72	15.35	16.84	20.01	24.13	28.75	33.37	38.57	43.67	255
Cargo Ton-Miles Flown (millions)											
Freight	38.0	76.3	114.2	202.4	278.7	293.3	314.5	317.7	397.5	506.9	1,233
Mail	45.8	55.4	61.7	68.9	86.7	93.0	99.3	119.0	142.1	158.5	246
Total**	143.4	203.4	253.0	353.2	407.0	427.9	457.6	478.1	590.9	717.1	400
EQUIPMENT											
Total Aircraft Operated	964	1,053	1,129	1,170	1,207	1,286	1,387	1,423	1,448	1,565	62
FINANCES											
Total Operating Revenues ($ millions)	573.8	691.5	771.2	840.2	1,024.6	1,169.6	1,300.5	1,438.1	1,639.4	1,787.8	212
Net Income After Taxes ($ millions)	— 26.4	1.1	17.2	40.6	56.4	61.4	60.8	67.1	76.0	77.1***	...
Total Capital Invested (average during year) ($ millions)	369.2	411.7	468.9	545.2	572.2	640.9	774.1	830.1	911.2	1,031.7‡	179
Flight Equipment Investment ($ millions)	193.9	232.4	248.8	257.4	289.7	370.2	447.6	524.3	543.3	648.3***	234
EMPLOYMENT											
Number of Employes [Average] (thousands)	85.1	84.6	82.3	85.0	99.3	107.6	113.2	113.4	127.0	140.8	65

** 1948 coach 4.8 million pass. miles.*
*** Also includes express ton-miles.*
**** As of June 30, 1956.*
† Over 1950.
‡ As of Sept. 30, 1956.

Transatlantic passenger traffic up 20%, cargo 31%

by Eric Bramley

FOURTEEN U.S. and foreign-flag airlines flying transatlantic routes between the U.S., Canada and Europe carried a record 783,835 first-class and tourist passengers in 1956, a substantial 20.17% gain over the 652,233 hauled in 1955. Totals do not include charter flights.

This was the biggest jump since 1952, when tourist service was introduced. The 1955 increase over 1954 was 18.58%; 1954 over 1953 was 8.56%; 1953 over 1952, 17.6%; 1952 over 1951, 30.9%.

Cargo gained at an even faster pace than passengers, registering a 31.1% increase over 1955.

The 1956 passenger totals include the 7,328 people carried during the April-December period by Canadian Pacific Airlines on its new Vancouver-Amsterdam polar route. They do not include Scandinavian Airlines System's transpolar traffic.

Gain on steamships

In addition to passengers on regular schedules, the airlines carried 49,858 on charters, bringing the grand total to 833,693. A 20% increase in business this year would put them over the million-mark, including charters, for the first time in history.

The airlines also continued to creep up on the steamship operators. Air traffic, including charters, amounted to 82% of steamship (all classes). Two years ago, it was only 61.7%; four years ago, 52.8%.

Last year the airlines operated 21,074 flights (up 17.1%), offered 1,224,523 seats (up 21.7%) and filled 64.01% of them.

There was a decided shift in the type of flights operated. For the first time, mixed flights (carrying both first-class and tourist passengers) led the field, while first-class and tourist trips decreased. Mixed flights jumped 58.5% from 5,958 in 1955 to 10,184. First-class dropped 18.9% from 4,996 to 4,050, and tourist fell 2.9% from 7,047 to 6,840.

The big increase was in tourist passengers. The 575,188 people using the lower-fare service represented a 24.4% jump over the 462,555 of 1955. First-class traffic gained only 10%, from 189,678 to 208,647. Of total passengers, 73.4% rode tourist against 70.9% in 1955. Of total seats offered for sale, 73.2% were tourist, up from 71.1%. The number of tourist seats for sale was 25.1% greater than 1955; first-class rose 13.1%.

Foreign lines recover

The foreign lines increased their share of the market, after slipping last year. Of the 783,835 passengers on regular schedules in 1956, they carried 421,133, or 53.7%. The two U.S. carriers, Pan American World Airways and Trans World Airlines, hauled 362,702, or 46.3%. Between 1954 and 1955, the foreign companies' percentage had dropped from 53.6% to 51.8%.

Excluding Canada-Europe and considering only travel to and from the U.S., the passenger total was 691,594, filling 63.01% of the 1,097,455 seats offered. The U.S. lines carried 52.4% of this business (53.8% in 1955) and offered 51.1% of the seats.

Of the U.S. passengers, 72.4% were tourist, up from 70.2% the year before. The tourist total, 500,426, was a 22% gain. First-class, 191,168, was up 9.7%.

PAA and TWA carried 47.3% of total first-class passengers and 51.7% of U.S. first-class. In the tourist field, they handled 45.9% of total and 52.7% of U.S.

PAA continued its leadership in all classes of traffic—passenger, cargo and mail. It transported 28.2% of all passengers, and 32% of those to and from the U.S.

Cargo gains 31.1%

The top five carriers of first-class passengers, in order, were PAA, BOAC, TWA, Air France and KLM. Tourist line-up was PAA, TWA, KLM, AF and SAS. Both classes, PAA, TWA, BOAC, AF and KLM.

Cargo last year totaled 18,721.5 tons, up 31.1% and bettering the 1954-55 increase of 30.5%. Cargo to and from the U.S. was 17,136.3 tons, up 31.5%.

A new certificated cargo operator, Seaboard & Western, started service in September, S&W, PAA and TWA handled 38.8% of the total cargo, against 35.1% for PAA and TWA in 1955. Of U.S. cargo, the three carried 42.4%.

Mail totaled 9,303.6 tons in 1956, up 13.3% from 1955. This was a considerably smaller increase than the 23.3% of 1954-55. PAA and TWA continued to dominate in the carriage of mail, handling 64.9% (70.4% to and from the U.S.). →

CAB tightens rules for transatlantic service

Civil Aeronautics Board has issued a Transatlantic Charter Policy for 1957 which tightens rules governing operation of "pro rata charters" by airlines not certificated for transatlantic passenger service.

The new policy became effective April 4 replacing one in effect since May 1955. Practices under the old policy were subjects of complaints recently made by Trans World Airlines.

A major change in CAB rules is that exemptions for charter flights will be granted "only where the charter price set forth in the exemption application is consistent with the terms of the applicable tariff on file with the Board and in effect at the time the exemption application is filed." Previously carriers had only to file a statement of their charter rates.

The agency also increased the advanced time for filing of a "pro rata" charter exemption application from 30 to 60 days prior to the scheduled departure of the first charter flight involved. "Pro rata" charters are those where individual passengers share the cost of the flight.

CAB emphasized its opposition to solicitation of individuals and said it will disapprove "any application of a proposed charter flight chartered by a group which has exceeded the prescribed scope of solicitation activities."

Under the ruling members of a chartering organization must have been members for a minimum of six months prior to the date when a contract is signed. CAB's Air Operations Bureau Director has been instructed to issue "advisory opinions" concerning the eligibility of a particular group pursuant to a request by either the charterer or the applicant air carrier.

According to CAB, airlines on numerous occasions have not complied with some aspects of the transatlantic policy. Because of this, the Board has decided "to incorporate the various provisions of that policy as express conditions upon each individual exemption granted to particular air carriers. Consequently, future violations of these requirements will be referred to the Office of Compliance for action.

Air traffic both ways between U.S., Canada and Europe, 1956

	UNITED STATES TRAFFIC														CANADIAN TRAFFIC					
	AF	BOAC	Lufthansa	El Al	Iberia	KLM	LAI	PAA	SABENA	SAS	S&W	Swiss	TWA	U.S. TOTAL	BOAC	CPAL	KLM	TCA	Canadian TOTAL	GRAND TOTAL
First Class																				
Rev. Pass.	18,390	27,764	4,941	0	2,126	15,220	2,281	72,957	3,998	11,748	0	5,917	25,826	191,168	8,126	1,362	2,757	5,234	17,479	208,647
Seat Capacity	27,118	43,404	11,123	0	6,404	24,705	6,374	110,596	6,969	17,191	0	7,833	39,393	301,110	13,437	2,570	4,212	7,256	27,475	328,585
% Seats Used	67.81	63.96	44.42	0	33.19	61.60	35.78	65.96	57.36	68.33	0	75.53	65.55	63.48	60.47	52.99	65.45	72.13	63.61	63.49
1st Class Flts.	106	814	2	0	0	568	0	1,711	10	360	0	103	327	4,001	48	1	0	0	49	4,050
Mixed Flts.	1,039	130	796	0	219	166	435	2,669	547	488	0	498	1,239	8,226	608	181	370	799	1,958	10,184
Cargo Flts.	0	8	0	0	0	359	0	607	7	0	182	109	112	1,384	2	0	3	0	5	1,389
Cargo (tons)	1,034.5	1,094.8	565.6	206.9	47.3	3,600.3	362.6	4,332.0	892.0	928.3	1,147.2	1,144.7	1,780.1	17,136.3	299.3	105.2	265.0	915.7	1,585.2	18,721.5
Mail (tons)	371.7	713.9	364.8	33.6	30.8	144.9	159.4	3,367.1	193.7	275.2	0	252.4	2,671.7	8,579.2	268.2	2.8	51.7	401.7	724.4	9,303.6
Tourist																				
Rev. Pass.	40,131	31,390	24,194	7,948	5,399	40,660	10,264	148,135	20,350	38,322	0	17,849	115,784	500,426	22,488	5,966	11,428	34,880	74,762	575,188
Seat Capacity	54,974	50,333	42,989	15,461	9,282	66,454	19,579	232,661	39,199	61,307	0	26,427	177,679	796,345	32,474	7,993	16,030	43,096	99,593	895,938
% Seats Used	72.99	62.36	56.27	51.40	58.16	61.18	52.42	63.66	51.91	62.50	0	67.54	65.16	62.84	69.24	74.64	71.29	80.93	75.06	64.19
No. of Flts.	222	531	29	261	0	889	2	1,595	210	592	0	20	2,442	6,793	33	5	9	0	47	6,840
All Traffic																				
Rev. Pass.	58,521	59,154	29,135	7,948	7,525	55,880	12,545	221,092	24,348	50,070	0	23,766	141,610	691,594	30,614	7,328	14,185	40,114	92,241	783,835
Seat Capacity	82,092	93,737	54,112	15,461	15,686	91,159	25,953	343,257	46,168	78,498	0	34,260	217,072	1,097,455	45,911	10,563	20,242	50,352	127,068	1,224,523
% Seats Used	71.28	63.10	53.84	51.40	47.97	61.29	48.33	64.41	52.73	63.78	0	69.36	65.23	63.01	66.68	69.37	70.07	79.66	72.59	64.01
No. of Flts.	1,367	1,475	827	261	219	1,623	437	5,975	767	1,440	0	621	4,008	19,020	689	187	379	799	2,054	21,074

Air traffic Eastbound between U.S., Canada and Europe, 1956

	UNITED STATES TRAFFIC														CANADIAN TRAFFIC					
	AF	BOAC	Lufthansa	El Al	Iberia	KLM	LAI	PAA	SABENA	SAS	S&W	Swiss	TWA	U.S. TOTAL	BOAC	CPAL	KLM	TCA	Canadian TOTAL	GRAND TOTAL
First Class																				
Rev. Pass.	8,950	13,762	2,367	0	1,203	7,529	1,141	34,104	2,069	5,997	0	2,935	12,781	92,838	3,818	625	1,149	2,458	8,050	100,888
Seat Capacity	13,486	21,583	5,460	0	3,224	12,318	3,136	55,341	3,467	8,695	0	3,892	19,868	150,470	6,695	1,261	2,124	3,674	13,754	164,224
% Seats Used	66.37	63.76	43.35	0	37.31	61.12	36.38	61.63	59.68	68.97	0	75.41	64.33	61.70	57.03	49.56	54.10	66.90	58.53	61.43
1st Class Flts.	53	406	1	0	0	280	0	856	5	181	0	52	162	1,996	24	0	0	0	24	2,020
Mixed Flts.	520	64	390	0	109	91	221	1,338	273	241	0	246	630	4,123	303	91	187	400	981	5,104
Cargo Flts.	0	8	0	0	0	178	0	299	4	0	91	54	57	691	2	0	2	0	4	695
Cargo (tons)	556.3	639.4	187.3	103.1	32.3	1,562.5	154.0	1,439.7	364.2	458.4	375.6	441.0	628.7	6,942.5	95.3	14.0	93.9	249.2	452.4	7,394.9
Mail (tons)	81.3	90.4	30.2	12.2	13.1	25.7	15.8	2,405.1	18.3	37.3	0	36.2	1,778.1	4,543.7	12.6	0.8	8.9	366.8	389.1	4,932.8
NOTE: Cargo and mail totals include tonnage carried on first class, tourist, mixed and all-cargo flights.																				
Tourist																				
Rev. Pass.	18,366	14,354	10,823	3,575	2,636	17,965	4,198	65,181	9,010	17,505	0	8,830	53,661	226,124	9,860	2,858	4,362	15,899	32,979	259,103
Seat Capacity	27,422	24,844	21,201	7,504	4,529	33,197	9,757	117,528	19,473	30,449	0	13,293	90,013	399,210	15,970	3,985	8,006	21,607	49,568	448,778
% Seats Used	66.98	57.78	51.05	47.64	58.20	54.18	43.03	55.46	46.27	57.49	0	66.43	59.61	56.64	61.74	71.72	54.48	73.58	66.53	57.74
No. of Flts.	108	258	17	130	0	442	1	820	103	299	0	14	1,236	3,428	19	3	3	0	25	3,453
All Traffic																				
Rev. Pass.	27,316	28,116	13,190	3,575	3,839	25,514	5,339	99,285	11,079	23,502	0	11,765	66,442	318,962	13,678	3,483	5,511	18,357	41,029	359,991
Seat Capacity	40,908	46,427	26,661	7,504	7,753	45,515	12,893	172,869	22,940	39,144	0	17,185	109,881	549,680	22,665	5,246	10,130	25,281	63,322	613,002
% Seats Used	66.77	60.56	49.47	47.64	49.52	56.06	41.41	57.43	48.30	60.04	0	68.46	60.47	58.03	60.35	66.39	54.40	72.61	64.79	58.73
No. of Flts.	681	728	408	130	109	813	222	3,014	381	721	0	312	2,028	9,547	346	94	190	400	1,030	10,577
NOTE: Total number of flights includes first class, tourist and mixed.																				

Air traffic Westbound between U.S., Canada and Europe, 1956

	UNITED STATES TRAFFIC														CANADIAN TRAFFIC					
	AF	BOAC	Lufthansa	El Al	Iberia	KLM	LAI	PAA	SABENA	SAS	S&W	Swiss	TWA	U.S. TOTAL	BOAC	CPAL	KLM	TCA	Canadian TOTAL	GRAND TOTAL
First Class																				
Rev. Pass.	9,440	14,002	2,574	0	923	7,691	1,140	38,853	1,929	5,751	0	2,982	13,045	98,330	4,308	737	1,608	2,776	9,429	107,759
Seat Capacity	13,632	21,821	5,663	0	3,180	12,387	3,238	55,255	3,502	8,496	0	3,941	19,525	150,640	6,742	1,309	2,088	3,582	13,721	164,361
% Seats Used	69.24	64.16	45.45	0	29.02	62.08	35.20	70.31	55.08	67.69	0	75.66	66.81	65.27	63.89	56.30	77.01	77.49	68.71	65.56
1st Class Flts.	53	408	1	0	0	288	0	855	5	179	0	51	165	2,005	24	1	0	0	25	2,030
Mixed Flts.	519	66	406	0	110	75	214	1,331	274	247	0	252	609	4,103	305	90	183	399	977	5,080
Cargo Flts.	0	0	0	0	0	181	0	308	3	0	91	55	55	693	0	0	1	0	1	694
Cargo (tons)	478.2	455.4	378.3	103.8	15.0	2,037.8	208.6	2,892.3	527.8	469.9	771.6	703.7	1,151.4	10,193.8	204.0	91.2	171.1	666.5	1,132.8	11,326.6
Mail (tons)	290.4	623.5	334.6	21.4	17.7	119.2	143.6	962.0	175.4	237.9	0	216.2	893.6	4,035.5	255.6	2.0	42.8	34.9	335.3	4,370.8
Tourist																				
Rev. Pass.	21,765	17,036	13,371	4,373	2,763	22,675	6,066	82,954	11,340	20,817	0	9,019	62,123	274,302	12,628	3,108	7,066	18,981	41,783	316,085
Seat Capacity	27,552	25,489	21,788	7,957	4,753	33,257	9,822	115,133	19,726	30,858	0	13,134	87,666	397,135	16,504	4,008	8,024	21,489	50,025	447,160
% Seats Used	78.99	66.83	61.36	54.95	58.13	68.18	61.75	72.05	57.48	67.46	0	68.66	70.86	69.07	76.51	77.54	88.06	88.32	83.52	70.68
No. of Flts.	114	273	12	131	0	447	1	775	107	293	0	6	1,206	3,365	14	2	6	0	22	3,387
All Traffic																				
Rev. Pass.	31,205	31,038	15,945	4,373	3,686	30,366	7,206	121,807	13,269	26,568	0	12,001	75,168	372,632	16,936	3,845	8,674	21,757	51,212	423,844
Seat Capacity	41,184	47,310	27,451	7,957	7,933	45,644	13,060	170,388	23,228	39,354	0	17,075	107,191	547,775	23,246	5,317	10,112	25,071	63,746	611,521
% Seats Used	75.76	65.60	58.08	54.95	46.46	66.52	55.17	71.48	57.12	67.51	0	70.28	70.12	68.02	72.85	72.31	85.77	86.78	80.33	69.30
No. of Flts.	686	747	419	131	110	810	215	2,961	386	719	0	309	1,980	9,473	343	93	189	399	1,024	10,497
NOTE: Canadian Pacific figures cover April-December. Seaboard & Western's cover September-December.																				

World airline revenues to top $4 billion this year

ICAO estimates free world carriers hauled 78 million passengers 45 billion passenger-miles, flew 1,030 million cargo ton-miles in '56

by Anthony Vandyk

OPERATING revenues of the world's scheduled airlines which totaled only $1 billion in 1947 should top $4 billion this year. By 1959, international airline traffic will be double that of 1955, the International Civil Aviation Organization forecasts. If only the average rate of increase for the last five or six years is maintained, doubling will occur by 1960.

And a study of postwar commercial air transport growth in the free world prepared by Richard Waldo and E. C. Moore of Convair's market research staff predicts traffic will increase threefold by 1970. This survey, released exclusively to AMERICAN AVIATION, is believed to be the first in which an attempt has been made to breakdown the growth of aviation into different areas of the world.

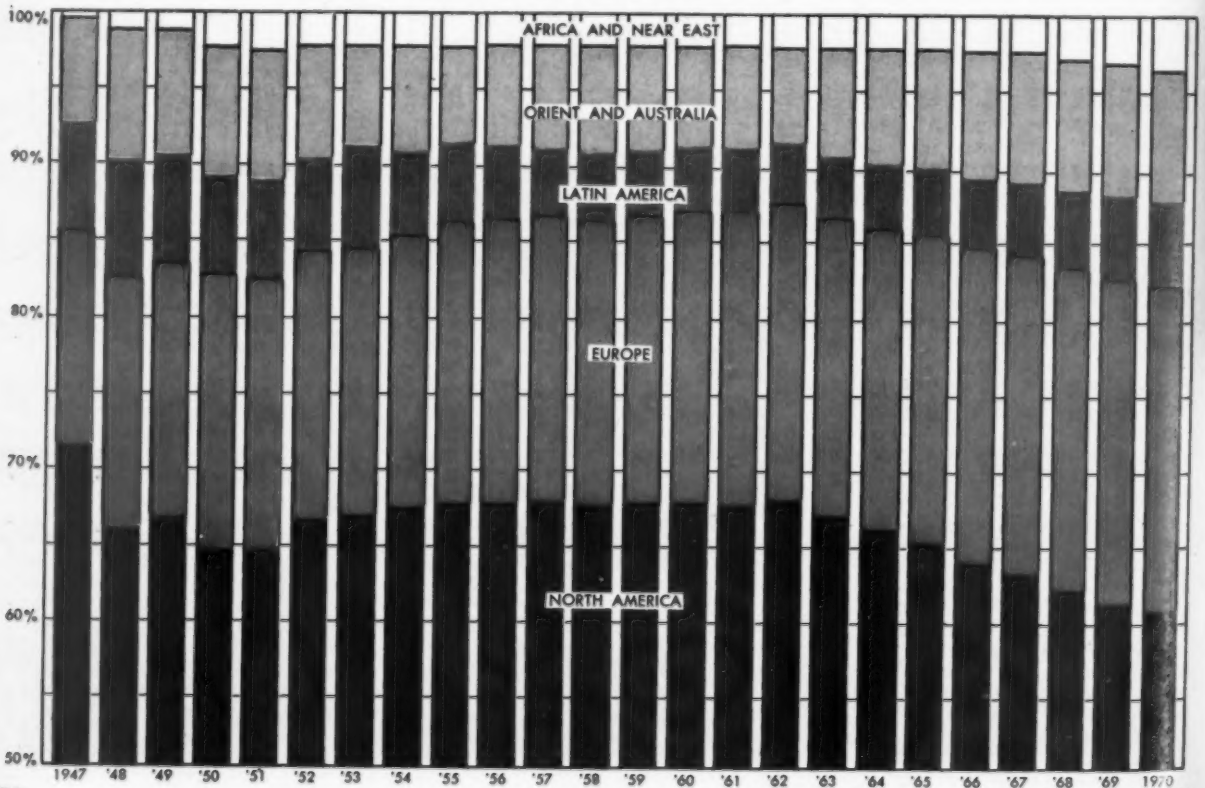
According to ICAO estimates, total world airline traffic in 1956 involved the flying of 45 billion passenger-miles, 1,030 million cargo ton-miles and 280 million mail ton-miles. During the year, 78 million passengers were carried and airline transports flew 8,200,000 hours covering 1,630 million miles.

In 1956 passenger traffic was 16% above the 1955 level, a 100% increase over the 1946 level. Cargo ton-miles were only 13% above the 1955 level and no more than 9% above that of 1946. Mail-ton miles, although up 8% from 1955, were actually down 23% from 1946.

These figures clearly show that while the increase in passenger business has been highly satisfactory, the cargo potential for international air transport is largely untapped and the mail situation is extremely disconcerting. The next congress of the Universal Postal Union to be held in Ottawa this year is almost certain to make further decreases in mail rates.

International air transport experts fear that for many carriers a cut in airmail rates will mean that they will have to be subsidized anew or to greater extent by their governments. Money for such subsidy would have to come out of the pockets of the taxpayers of those countries which provide international air transport and

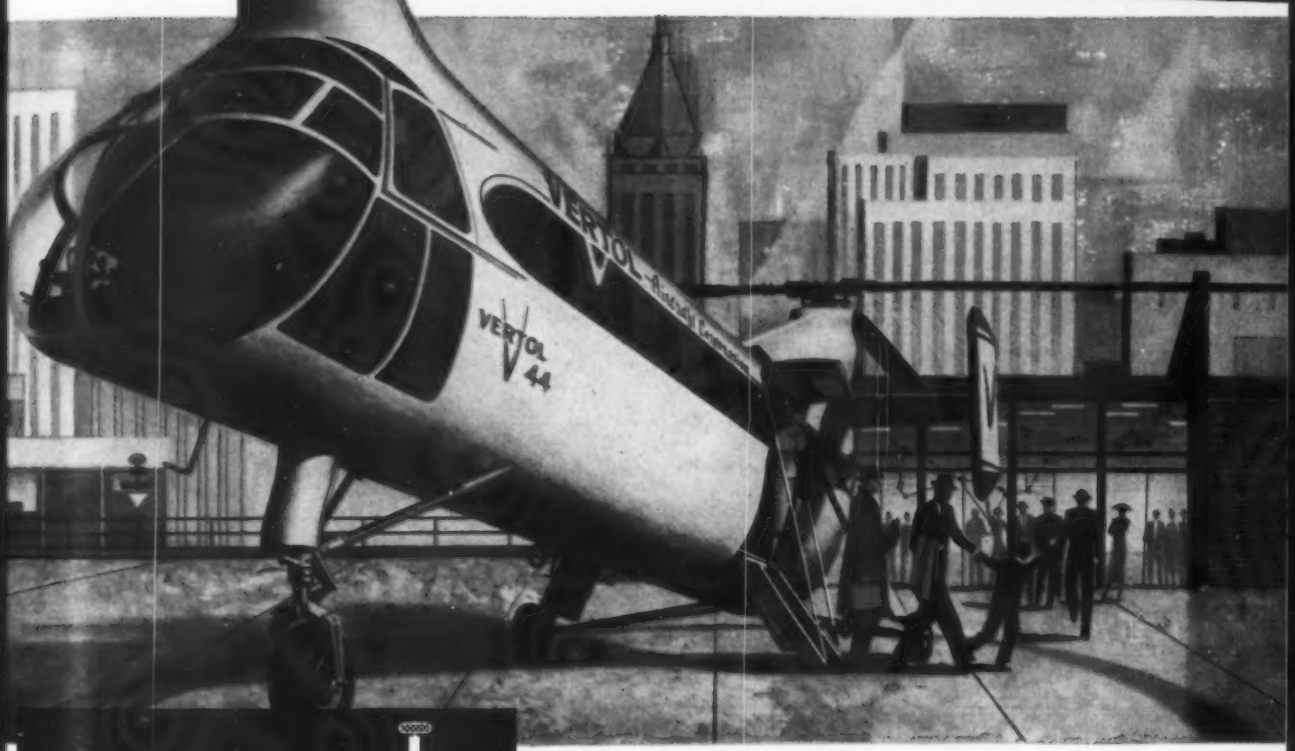
DEVELOPMENT of air transport in the free world from 1947 through 1970 is shown in this chart prepared by Convair's market research staff. Data is shown in billions of revenue passenger-miles, and for the years after 1955 is estimated.

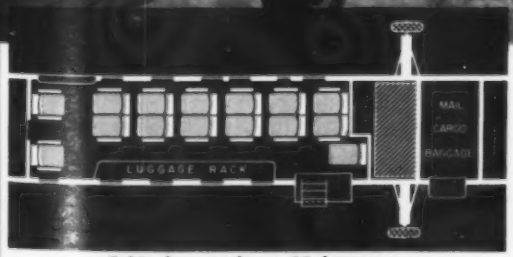


New Vertol helicopter seats 19 passengers, doubles as freighter

For the first time, a large capacity helicopter, the Vertol 44, is available to commercial operators. And it comes with a selection of interiors suited for airline operation, executive transportation, or combination passenger-freight use.

Based on the design of the famous Vertol H-21, which has been flown more than 100,000 hours by the military services of the United States, Canada, France and West Germany, the Vertol 44 offers the versatility and cabin capacity long lacking in civilian helicopter operation.





Cabin layout shows 15 luxury seats in Vertol 44 airliner version.

Engineers, if you are not already working for the government or defense industry, investigate job opportunities with Vertol.

Check these new Vertol 44 features:

- **Highest useful load, greatest seating capacity, lowest seat-mile cost in commercial helicopter field. Tandem rotor design allows passengers to sit any place in cabin and eliminates balance problem in placement of cargo.**
- **Internal capacity, approximately 600 cu. ft. of freight in cargo version. Can carry 2½ tons on external cargo sling.**
- **Capacity for 19 passengers, using high density seating arrangement. Luxury seats for 15 in airline version with large window next to every seat. Seats fold away for conversion in minutes to cargo configuration.**
- **Two large doors permit quick and easy loading and unloading; rear door folds down with integral stairway.**
- **Better high altitude performance with two-speed engine supercharger.**

For detailed information on the Vertol 44 write to:

Customer Relations Manager

VERTOL *Aircraft Corporation*

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Fast carrier task forces of the new Air Navy stand guard 24 hours every day on the seas of the free world—75% of the earth's surface. Key weapon in this vital mission is the Navy's fastest all-weather fighter-interceptor, the McDonnell F3H Demon. The Allison-powered Demon has proved that it's ready for action in any weather, day or night.

A single Allison J71 Turbo-Jet, producing more than 10,000 pounds thrust, gives the Demon speeds of over 600 mph to engage enemy aircraft at high altitude. Allison engines are designed and built by America's pioneer producer of turbine aircraft engines.

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GM AIRCRAFT POWER

would go largely into the coffers of the post offices of the countries which do not have major air networks.

International airline officials hope to be able to persuade the Ottawa congress that a forthcoming jet age will speed the transportation of airmail by as much as 40% which should be of benefit to the postal administrations by increasing their efficiency in the eyes of the public. Because of this it seems wrong for a reduced rate to be introduced for a more efficient service.

When airmail rates were cut by the UPU some years ago there was no corresponding reduction in postal charges to the public. The reduction in airmail rates for the carriers was used only to put more money in the postal administrations and not to make airmail service cheaper to the public. In fact there seems to be no indication that the public is concerned about present airmail charges. As International Air Transport Association puts it, "the prospects are that worthwhile reduction in charges to the public will only materialize when the post offices are willing to send all long distance mail by air without surcharge."

Cargo lacks suitable aircraft

The public seems to be satisfied with postal charges for airmail service and is very definitely airmail conscious. There is every evidence, however, that the public is not cargo conscious. The postwar development of international air cargo has been disappointing and there seems to be no real prospect of a substantial change in the situation until carriers make a greater effort to tap this market. A major handicap, of course, has been the lack of suitable cargo aircraft—the use of modified passenger transports is not satisfactory or economic.

It seems reasonable to assume that for the next two decades passenger traffic will continue to provide the bulk of the revenues of the world's airlines. There seems to me no leveling off of the demand for passenger air transportation and even fare increases have no repercussions on traffic figures. At the present time the airlines are faced with steeply rising costs, and fare increases rather than decreases are likely to occur during the next two years.

There is a sharp division of feeling as to whether the big turboprops and jets will enable international fares to be reduced. The manufacturers, of course, tend to say they will, and, equally naturally, the operators are reluctant to make any forecasts until they actually prove out the manufacturers' brochure figures with operating experience.

Another big question mark on the international scene is what is going to happen to the piston engine aircraft that will be displaced by the jets and turboprops. Will they be used for lower-fare services on the same routes as the jets? Or will they have to be disposed of, and where?

International operators on long-haul routes with turbine equipment started on a large-scale with the introduction by BOAC of the Britannia early this year. The big Bristol turboprop transport is currently flying from England to South Africa and to Australia. This summer it will go on the North Atlantic routes of BOAC and El Al and in the latter part of the year it will be introduced on Canadian Pacific's long-haul routes.

Russia opens jet service

First use of jet transports in commercial international operations since the grounding of the Comet in 1954 began last year when Russia's Aeroflot introduced Tupolev Tu-104 equipment onto the Moscow-Prague route. The Soviet carrier probably has upward of 30 of these twin-jet aircraft but to date has been hesitant to introduce them on large scale international operations.

Despite many overtures from the west, Aeroflot has so far refrained from joining IATA and until it does, Russian international operations probably will be restricted.

Several of the world's airfaring nations would welcome Russia into IATA as it would be a step toward gaining traffic rights for their airlines to operate long-haul routes via Russia. Scandinavian Airlines System and BOAC have both studied with great interest the possibility of operating from Europe to the Far East via the Soviet Union. Such a routing would afford even greater time saving than the polar route.

Early this year SAS inaugurated its second polar route linking Scandinavia with Tokyo and indications are that within the next year other operators will have followed SAS' leadership in linking the west coast of the U.S. with Europe via the Far North. Pan American is expected to be the next airline to start a polar service. BOAC has already extended its London-New York service to San Francisco.

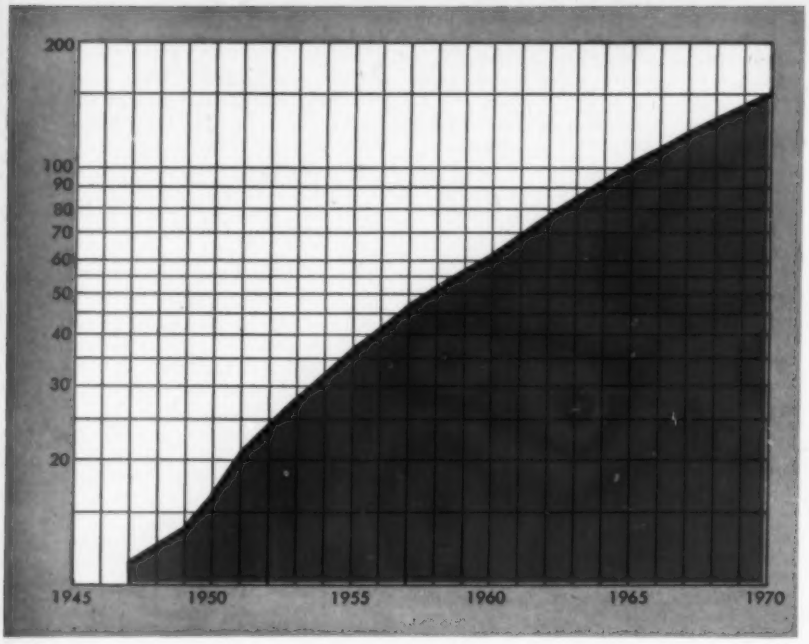
Apart from the SAS polar route no new major routes have been opened

Postwar growth of commercial air transportation in the free world

(Billions of revenue passenger miles)

	FREE WORLD		NORTH AMERICA			EUROPE			LATIN AMERICA			ORIENT & AUSTRALASIA			AFRICA & NEAR EAST		
Year	Revenue Pass. Mi. (Billions)	% Inc.	Revenue Pass. Mi. (Billions)	% of Total	% Inc.	Revenue Pass. Mi. (Billions)	% of Total	% Inc.	Revenue Pass. Mi. (Billions)	% of Total	% Inc.	Revenue Pass. Mi. (Billions)	% of Total	% Inc.	Revenue Pass. Mi. (Billions)	% of Total	% Inc.
1947	11.4	21.5	8.2	71.6	12.6	1.6	14.0	46.2	.7	7.0	32.6	.8	7.0	67.4	.10	.4	104.0
1948	12.4	10.9	8.2	66.1	...	2.1	16.4	27.9	.9	7.6	26.5	1.1	8.8	35.7	.14	1.1	37.8
1949	13.9	11.8	9.3	66.9	12.5	2.3	16.6	12.3	1.0	7.0	2.7	1.2	8.4	7.3	.15	1.1	13.3
1950	16.8	15.7	10.9	64.9	17.6	3.0	17.9	30.4	1.1	6.5	13.4	1.5	8.7	25.0	.38	2.3	148.0
1951	21.1	25.6	13.7	64.9	19.3	3.7	17.5	23.3	1.4	6.6	27.3	1.8	8.3	20.0	.49	2.4	28.9
1952	24.6	16.6	16.4	66.7	19.7	4.3	17.5	16.2	1.5	6.1	7.1	1.9	7.6	5.3	.54	2.2	10.2
1953	28.5	15.9	19.1	67.0	16.5	5.0	17.5	16.3	1.9	6.7	26.7	1.9	6.7	3.5	.62	2.2	14.8
1954	32.0	12.3	21.6	67.5	13.1	5.7	17.8	14.0	1.8	5.6	(-5.3)	2.2	6.7	11.9	.73	2.2	17.7
1955	37.1	15.9	25.1	67.7	16.2	6.9	18.6	21.0	1.9	5.1	5.6	2.4	6.5	9.7	.80	2.2	9.6
1956	42.1	13.5	28.5	67.7	13.6	7.9	18.8	14.5	2.0	4.8	5.3	2.8	6.6	16.7	.90	2.1	12.5
1957	47.3	12.4	32.1	67.9	12.6	8.9	18.8	11.4	2.1	4.4	5.0	3.2	6.8	14.3	1.00	2.1	11.1
1958	52.0	9.9	35.2	67.7	9.7	9.8	18.8	11.4	2.3	4.4	4.5	3.6	6.9	12.5	1.10	2.1	10.0
1959	56.8	9.2	38.5	67.8	9.4	10.8	19.0	10.2	2.4	4.2	4.3	3.9	6.9	8.3	1.20	2.1	9.1
1960	62.5	10.2	42.5	67.9	10.4	12.0	19.3	11.1	2.6	4.2	8.3	4.1	6.5	5.1	1.30	2.1	8.3
1961	70.2	12.1	47.6	67.8	12.0	13.6	19.4	13.2	2.9	4.1	11.5	4.7	6.7	14.6	1.40	2.0	7.7
1962	77.5	10.3	52.7	68.1	10.7	15.2	19.6	11.8	3.1	3.9	7.0	4.9	6.3	4.3	1.60	2.1	14.3
1963	85.6	10.1	57.4	67.1	8.9	16.9	19.7	11.2	3.4	4.0	10.0	6.1	7.1	24.5	1.80	2.1	12.5
1964	94.2	9.9	62.4	66.2	8.7	18.8	20.0	11.2	3.9	4.1	14.7	7.1	7.5	16.4	2.00	2.1	11.1
1965	102.9	9.2	67.3	65.4	7.9	20.8	20.2	10.6	4.6	4.5	17.9	8.0	7.8	12.7	2.20	2.1	10.0
1966	111.6	8.5	71.7	64.2	6.5	22.9	20.5	10.1	5.4	4.8	17.4	9.2	8.2	15.0	2.40	2.2	9.9
1967	121.0	8.4	76.7	63.4	7.0	25.1	20.8	9.6	6.2	5.1	14.8	10.3	8.5	12.0	2.70	2.2	12.5
1968	130.7	8.0	81.6	62.4	6.4	27.4	21.0	9.2	6.9	5.3	11.3	11.4	8.7	10.7	3.40	2.6	25.9
1969	140.5	7.5	86.4	61.5	5.9	29.7	21.2	8.4	7.9	5.7	11.4	12.5	8.9	9.6	4.10	2.9	20.6
1970	150.3	7.0	91.6	60.9	6.0	32.1	21.4	8.1	8.6	5.7	8.9	13.7	9.1	9.6	4.90	3.3	19.5

Source: Convair—San Diego



CUMULATIVE percentage distribution of revenue passenger-miles performed by airlines in the free world are shown in this study prepared by Convair. Little change in overall picture is anticipated until early 1960s when effect of introduction of jets will begin to be felt on worldwide basis.

up recently although several companies have made their appearance on existing routes of their competitors. Perhaps the biggest expansions are being undertaken by Swissair and Lufthansa with the extension of their systems across Asia to Tokyo. Both companies are developing fast (Lufthansa has had tremendous success in re-establishing its pre-war reputation) and by 1960 they will probably rank near to SAS and KLM.

Both the latter carriers may have difficulty in expanding their system much beyond their present size due to increasing difficulty in obtaining traffic rights. The recent negotiations in Washington with the Dutch which reached a presidential level pointed up how difficult it is for nations to gain new routes for their carriers if they have little to offer bigger nations.

Not only are new routes becoming increasingly difficult to obtain but traffic rights on existing routes are being curtailed in several instances. As more and more capacity is offered by the airlines, many countries are becoming extremely protective. This attitude makes it extremely hard for the airlines of the "have-not" nations to make a living.

Despite increasing competition in the international air transport field and the increasing restrictiveness on the part of nations as regards traffic rights, more and more small airlines are getting into long-haul operations. For example,

Ethopian Airlines has ordered a fleet of DC-6Bs as a preliminary to a route expansion program.

Middle East Airlines and **Iraqi Airways** have extended their systems to western Europe.

East African Airways is starting service to Europe for the first time and West African Airways is planning to do the same.

ALA and CINTA, two non-IATA Chilean airlines, have acquired four-engine equipment to operate to Panama and (in the case of CINTA) the U.S. (Cut-rate operations to U.S. by Latin American carriers has IATA airlines worried.)

LAN, the flag airline of Chile, has ordered additional DC-6Bs to extend its routes to the U.S. and possibly across the Pacific to Australia.

Several new airlines in Argentina have been established under a new policy of the government encouraging private enterprise. The most important seems to be Transcontinental, associated with the California Eastern Airways, which plans to start service to the U.S. with Super Constellations this year and possibly extend its operations to Japan in 1958.

In Brazil, VARIG is actively planning a route to Europe with terminals other than the points already served by Panair de Brazil. PLUNA of Uruguay is planning to extend its operations to the U.S.

In Mexico, there is, of course a large area of expansion in the works following the conclusion earlier this year of a bilateral air transport agree-

European Airport Traffic

City	1956 Aircraft Movements	1956 Passengers (embarked, disembarked and transit)	1956 Freight (loaded or unloaded—Metric tons)	Percentage Change 1955/1956 Aircraft Movements	Percentage Change 1955/1956 Passengers (embarked, disembarked and transit)	Percentage Change 1955/1956 Freight (loaded or unloaded)
Amsterdam	62,730	843,827	25,240	+19.1	+13.7	+14.3
Berlin	30,392	979,945	27,899	+14.2	+17.5	—23.6
Brussels	51,957	531,976	10,927	+19.6	+14.3	+18.8
Copenhagen	57,227	1,006,589	10,427	+ 1.8	+25.7	+18.8
Dublin	23,072	457,856	6,553	+14.3	+16.9	+ 5.0
Frankfurt	47,997	1,181,686	11,699	+18.0	+24.6	+10.7
Geneva	30,803	559,014	3,597	+13.4	+19.4	+ 7.8
Hamburg	44,224	581,233	12,113	— 4.4	+17.3	—11.7
London	122,952	3,094,342	40,377	+ 2.8	+14.1	+17.2
Marseilles	40,821	782,917	6,847	+12.6	+19.7	+11.2
Nice	22,791	540,761	1,798	+17.6	+19.9	+41.6
Oslo	37,861	357,569	2,049	+31.4	+40.8	+15.1
Paris	103,909	2,254,115	37,967	+23.6	+24.5	+33.1
Stockholm	58,446	526,986	5,710	+23.8	+20.4	+15.9
Zurich	67,347	818,433	8,542	+ 8.6	+18.8	+26.4
TOTAL OR AVERAGE	802,529	14,517,239	211,745	+12.9	+19.4	+ 9.0

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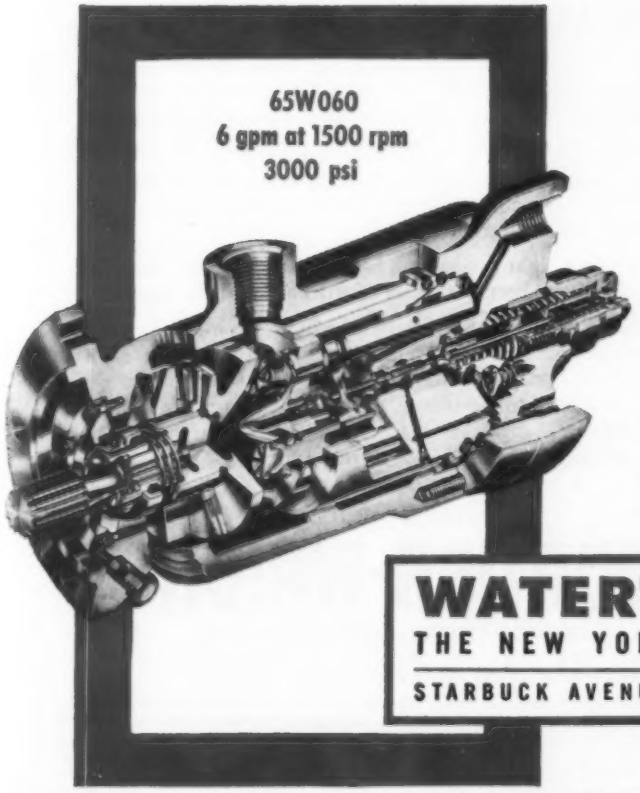

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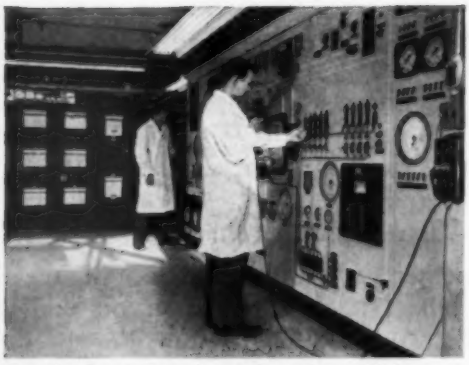

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ment with the U.S. Mexican carriers will start service to several additional points in the U.S.

On the other side of the world Afghanistan's Aranya airline is seeking new equipment and backing in order to expand its operations to Europe. In neighboring India, Air-India International contemplates extending its route to Tokyo across the Pacific to San Francisco. Next year the India-London route will probably be prolonged across the Atlantic to New York.

In Europe, the merger of Alitalia and LAI into a single Italian flag carrier is likely to be consummated before the year is out. Austria's two paper airlines (the KLM-backed Air Austria and the SAS-backed Austrian Airways) have merged, but there is no indication yet as to when the Austrian flag carrier will start operations.

In the equipment field among long-haul international airlines the most consistent current development is the continuing swing to Turbo Compound-powered aircraft. The DC-7C has become the "speed queen of the North Atlantic" and has also been introduced on many other long-haul intercontinental routes in the last year.

In a few months, Lockheed's rival product, the L-1649A will make its appearance on the North Atlantic along with the Britannia. On the shorter haul routes the Viscount continues to penetrate.

This year will see the start of deliveries of British turboprop transports to KLM Royal Dutch Airlines, among other major carriers.

Outside of Europe, however, the DC-3 and the DC-4 remain supreme for the shorter routes and this position will continue through this decade.

Orders for DC-3 replacement aircraft such as the Fokker F-27 Friendship and the Handley Page Herald have been slow in coming in although this is not necessarily due to lack of a desire to buy on the part of carriers: finance is a very big stumbling block to those who bought DC-3s a decade ago or more at bargain basement prices.

French airlines carry 3 million passengers

by Jean-Marie Riche

PARIS—Commercial air transport is booming in France.

In 1956 more than 3 million passengers were carried by the French airlines, 26% more than in 1955. Cargo volume at 70,000 tons was 16% up.

These figures represent about 2.4 billion passenger-miles and 300 million ton-miles, increases of 20% and 17% respectively above 1945.

The growth is reflected in the figures for passenger traffic at the major French airports. Paris' two airports (Orly and Le Bourget) handled 2,254,115 passengers in 1956, ranking second only to London among European cities. The figures represent a 24.5% increase over 1955.

Mainly responsible for the increased traffic was France's national airline, Air France, which operated 73% of the passenger-miles and 73.5% of the ton-miles of all French air transport. Air France is particularly proud of its achievements on the highly competitive North Atlantic route where in 1956 it increased it's traffic by 31% against the overall IATA average of 22%.

For Air France, 1956 was a year of consolidation rather than extension of new routes. The management concentrated on offering improved schedules and better service and this policy will be continued this year. Perhaps the most important event for Air France in 1957 will be the introduction of the Lockheed L-1649A Super Starliner. Eight of the 10 L-1649As ordered last year are scheduled to be placed in operation in the second half of 1957.

In 1958 the full effect of this additional equipment will be seen on the North Atlantic although a record 24 round trip flights weekly will be operated this summer Transatlantic operations will be stepped up in preparation for introduction in 1960 and 1961 of the 17 Boeing 707s. Prior to this Air France will re-enter the jet field with the Caravelle. It is well experienced in turbine transport operations. It had valuable, though costly, experience with the Comet and has completed several hundred hours of scheduled flying with the Caravelle prototype.

Air France is so pleased with the French-built jet, 12 of which are on order, that experimental passenger operations may be started with one of the two prototypes this fall. Air France also has had turbine experience for several years with the Vickers Viscount.

Apart from Air France, the three major French independent airlines developed fast last year. UAT, backed by Chargeurs Reunis (a major shipping company) has ordered two Douglas DC-8s, will buy three more as soon as circumstances permit.

Route to South Pacific

TAI, whose order for DC-8s was also restricted by the French government (again to two aircraft), also plans to increase its order to four planes as soon as possible. In addition to its important routes to the French Union, TAI currently is engaged in the development of a route linking France with the South Pacific. Three DC-7Cs scheduled for delivery at the end of this year and early next year will replace the DC-6Bs now used on this run, which the airline says is the world's longest.

It may not be generally realized outside of France that while Air France is the largest user of Constellations and Super Constellations outside of the U. S., UAT and TAI operate between them a fleet of 12 DC-6 type aircraft with a higher rate of utilization than any other Douglas user.

Special mention should be made of the progress accomplished in 1956 by CGTA-Air Algerie, a subsidiary of the French line which operates exclusively between France and Algeria and on domestic Algerian routes. It carried more than 230,000 passengers in 1956, a 42% increase over 1955.

The almost 3,000 tons of cargo hauled by this carrier represents a 63% increase. In 1957 it is expected that Air Algerie will carry 43% of all traffic between France and Algeria.

It is of interest to note the political changes within the French Union have not really harmed the French air transport industry. Both Morocco's Compagnie Cherifienne des Transports Aeriens and Tunis' Tunisair are cooperating with Air France. In the Far East, where the countries formerly grouped as Indonesia have been independent for several years, the French carriers have maintained excellent connections with Air Vietnam, Air Laos, Royal Air Cambodge. And Aigle Azur-Extreme Orient, the only survivor of the once large French operating company in this area still has a large fleet in operation, including six Boeing 307 Stratoliners.

The French air transport system is based on a high cost economy. This partly explains why Air France although it has a very high load factor, still has a slight operating deficit which has to be compensated by an operating subsidy.

Will the common market balance the basic conditions on which the airlines live in the participating countries? And will the common market open to competition routes of the French Union now protected by the flag monoply? Obviously these developments are only long range ones that have to be dealt with. But they explain why Air France is now seeking a long-term truce with its French competitors in the form of a "coordination agreement" for the period of 1961-1971.

This development, at the present time, is the subject of much pre-occupation among both the French government and the carriers. Strong political pressure was used in 1956 in connection with the creation of Air Inter, a company formed by many conflicting interests to operate a domestic service in France. But with the re-establishment of French taxes on aviation gasoline in France for domestic services, the future of Air Inter is far from clear.

It is important, nonetheless, that the company has been set up. Many experts regard this as an attempt by the railroad to obtain a foothold in the air transport business and gradually take control of domestic routes in the common market countries. Such plans may meet with very strong resistance among foreign carriers and in France from the air transport workers union which recently has been playing an increasingly important part in the commercial air policy of the nation.

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Air cargo tops all records in '56: 717 million ton-miles

Figure betters 1955 mark by 21%; air freight is biggest single factor in increase

by Wallace I. Longstreth

SOME MEAT was put on the bones of the air cargo industry last year. By the end of 1956, U.S. scheduled airlines had hauled 717 million ton-miles of cargo. This topped 1955's record by 21%, or 126 million ton-miles

While slight gains were registered in air mail and air express, the biggest single factor in the air cargo increase over the previous year was the activity in air freight. This was largely confined to a few airlines.

The big four trunklines, American Airlines, United Air Lines, Trans World Airlines, and Eastern Air Lines, produced 159.9 million ton-miles.

Three all-cargo airlines, Riddle Airlines, The Flying Tiger Line, and Slick Airways, found another 152.4 million ton miles. AAXICO Airlines, also a domestic scheduled all-cargo carrier, did not start operations on its new certificate until November 15, 1956.

American Airlines dug deep into the air freight business, and came up leading the parade again with 71.4 million ton-miles, a gain of 7% over 1955. Next in line were the Flying Tigers (67.6 million ton-miles, up 35%), Slick (63.6 million ton-miles, up 21%), and United (50.1 million ton-miles, up 27%).

No one single development stands out as responsible for the growth. Rather, it was a combination of many factors.

The economic climate was good. This was something the airlines could not control. American dignified the air cargo business and appointed a vice president-cargo. Samuel C. Dunlap, a veteran airline and cargo man, fills the post. AA introduced the deferred air-freight operation, which was adopted almost immediately by other carriers.

Long-range selling pays off

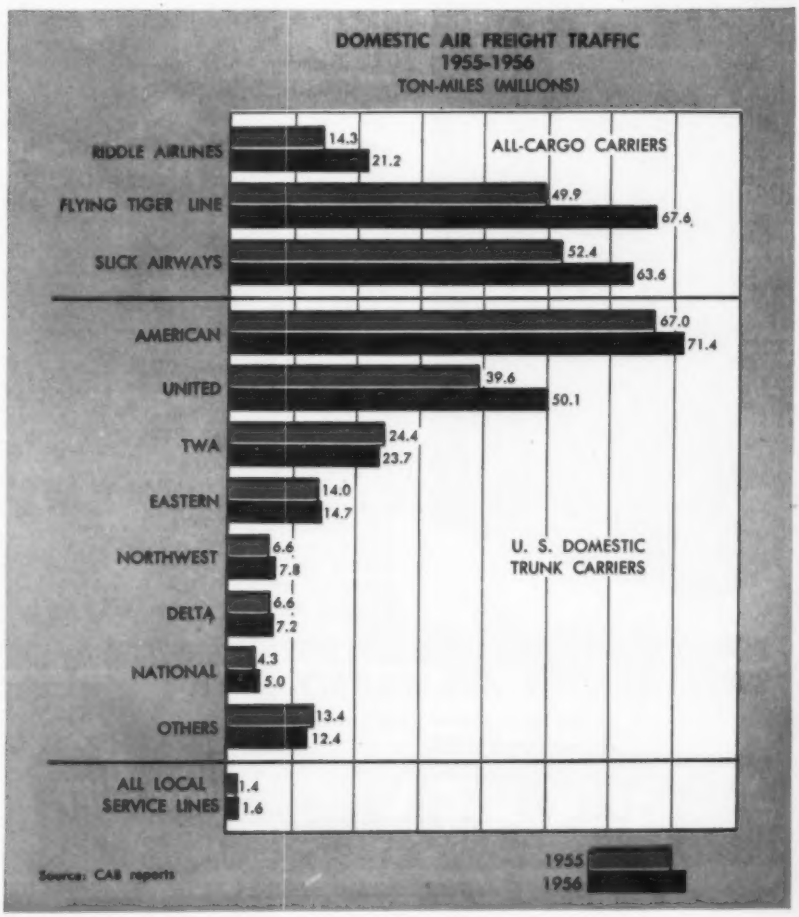
AA also worked hard on its program of developmental selling based on total distribution costs as opposed to only the transportation charges of a single shipment. This program was started in 1955. It is primarily long-range selling which proves to potential shippers that lower distribution costs, expanded markets and improved customer service result from the use of air freight.

In 1956, previous effort began to pay off. American believes that even greater benefit will result from this activity in years to come. This feeling is shared by the other major air-freight carriers, and they, too, have developmental selling programs.

Also benefiting 1956 operations was the five-year extension of the all-cargo airline certificates by the Civil Aeronautics Board. At the same time, CAB gave a one-year authorization to haul mail and express. A number of joint arrangements for truck-air-truck and bus-air-bus service were set up, expanding markets to many points far removed from airports.

All of these things helped the air-freight business and all those concerned with air cargo.

Percentage-wise, the all-cargo airlines results were more than comforting to those who believe that air freight will one day provide lots of revenue.



The three all-cargo airlines accounted for 44% of the domestic scheduled air freight tonnage. In 1955, the all-cargo airlines hauled 40% of the total.

Of the total air-freight tonnage, the top five carriers stack up this way: American, 20.7%; Flying Tigers, 19.6%; Slick, 18.4%; United, 14.5%; and TWA, 6.8%. The other 20% was divided among Riddle, the remaining trunks, and the local service airlines.

Trunks took in $92 million

Revenue-wise, the cargo operations for the combination carriers have a long way to go. In 1956, the domestic trunks took in some $92 million for hauling things—this includes revenue from mail, express and freight. It does not include revenue from baggage of passengers.

The $92 million amounts to a little over 7% of total trunkline revenue. Air freight, $42.9 million, provided 3.3% of the trunks' revenue.

American, the largest carrier of air cargo, takes in 9% of its revenue from cargo; 5% from air freight. United also takes in 9% of its revenue from cargo. United's air freight contributes 4%. TWA derives 7% from cargo; 3% from air freight. As the carriers get smaller, the impact of air freight on total revenues tends to lessen.

How profitable air-freight operations are is still the subject of much debate. The CAB is working to develop the yardsticks. Principal problem is determining what the air freight costs are.

Except for all-cargo aircraft, the combination airlines (those hauling both passengers and cargo) do not have a big investment in equipment devoted exclusively to cargo. In an AMERICAN AVIATION survey, it was found that most of the airlines use ground equipment for both passengers and cargo and that no attempt is made to allocate costs to the separate services.

This cost problem is not unique with the combination carriers. The all-cargo airlines also have the problem of allocating costs of equipment between military, charter (both passengers and freight) and scheduled common carrier activities.

Needed: an industry philosophy

The cargo fleet expanded considerably in 1956. By the end of the year the combination airlines were flying 12 DC-6As (AA, 7; UAL, 5), 17 DC-4s (AA, 2; TWA, 7; UAL 8), and 2 DC-3s (Delta). Delta is in the process of expanding its cargo fleet to include five C-46s.

The all cargo airlines were operating C-46s, C-54s (DC-4s), DC-6As, and Super Constellations in scheduled all-cargo services.

Still needed is a basic industry philosophy. A definition of the potential and worth of air freight varies between companies, and even between departments of the same company. One school views air freight as a refinement of the transportation system of the country. The other school assumes the theory that air freight is a whole new world.

The first believes that when equipment and other conditions are right, air freight will move in on the transportation market as the railroads moved in on the canals. The second argues that air freight needs coddling, promoting, the application of any gimmick which will stimulate interest and growth. This school leans to bargain-day rates, every day, for everyone. In opposition are those who "can't see giving away a perfectly good service."

Net result is that energies of either group are diluted by the other. Discussions to resolve these differences have not been fruitful, since the airlines must skirt issues dealing with rates. This proscription extends far beyond the discussion of rate levels which would subject carriers to anti-trust action.

In this atmosphere, the air-freight forwarders are thriving. The service they perform is real and oftentimes at a rate lower than the direct carriers charge.

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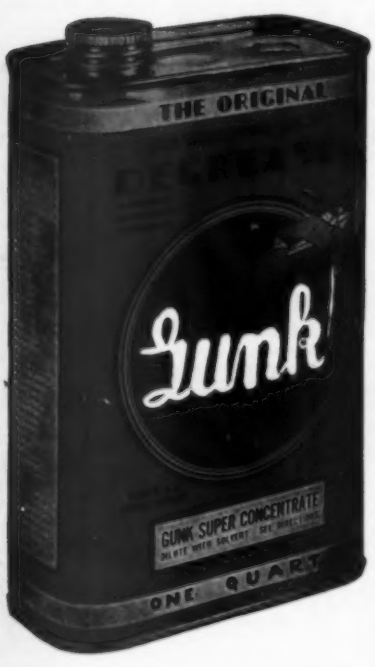

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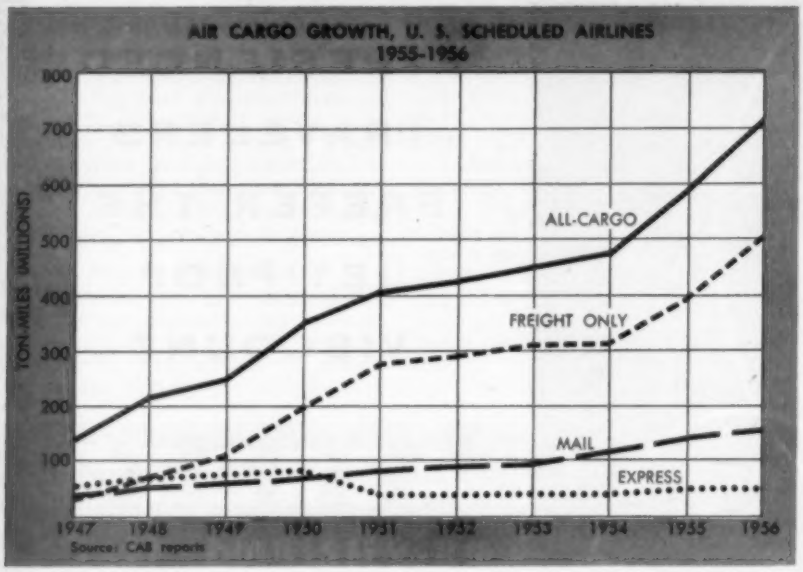

SHARP RISE in freight traffic since 1954 has boosted total cargo ten-miles from below 500 million to more than 700 million in two years.

direct air-carrier service. Of this number, 59 concerns had sufficient activity to require reports to the CAB. As a group, gross revenues topped $30 million, and the 14 top air-freight forwarders grossed $26.6 million (see accompanying table). Together, they bought $12.5 million worth of air-freight transportation.

Consolidation cuts cost

By consolidating shipments—taking many small shipments from many customers and grouping them as one big shipment—the forwarders take advantage of the rate spread. Thus, the shipper of a little package often pays less to the forwarder than he would if he took his package to the airline.

As an example of consolidating, American Shippers received from shippers 336,270 separate shipments in 1956. By consolidating, the forwarder paid for 43,516 shipments. Before consolidating, American Shippers' average shipment weighed 32 pounds. After consolidating, average shipment weight increased to 252 pounds.

By shipping at the rate per 100 pounds, the forwarder saves about 35% over the rate per pound. Part of this can be passed on to the shipper. As this issue is being put to bed, CAB was studying the proposition of requiring forwarders to conform to the same minimums required of the direct air carriers. While CAB's position has not been declared, the Board's examiner has stated that he does not think the minimums should be applied to forwarders.

Top air-freight forwarders—1956

Forwarder	Gross revenue	Paid to air carriers	Shipments delivered to scheduled airlines: Number	Shipments delivered to scheduled airlines: Tons
Emery Air Freight Corp.	$9,302,258	$4,065,276	192,471	18,077.9
American Shippers, Inc.	2,728,200	1,817,062	43,516	5,484
Air Express International Corp.	2,167,977	1,116,211	13,401	1,288.5
Airborne Flower & Freight Traffic, Inc. (9 months)	991,473	961,931	42,061	6,110
Western Transportation Co., Inc. (W.T.C.)	4,042,416	816,839	5,468	2,433.7
Hensel, Bruckmann & Lorbacher, Inc.	1,985,824	644,546	3,447	86.9
Wings & Wheels Express, Inc.	1,071,574	619,048	14,293	2,748.9
ABC Air Freight Co.	896,255	609,334	13,982	2,297.7
United Parcel Service-Air	849,364	523,983	9,967	1,705.6
Acme Air Cargo, Inc.	566,665	456,393	1,763	1,509
Allied Air Freight	481,963	371,200	6,189	1,616.1
Pan Maritime Cargo Service	575,497	360,915	600	603.8
Flete International Corp.	483,521	54,389	7,214	485
Freedman & Slater, Inc.	490,185	48,178	5,660	114

Ranked in the order of the amount of air transportation purchased from the scheduled airlines.

Source: CAB statistics.

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Airlines prefer three-letter abbreviations

Two letters acceptable for reservations and ticketing but not for advertising, other purposes, survey shows

Although the U.S. airlines have been using a two-letter code since last June for all reservations and ticketing activities, an AMERICAN AVIATION survey shows that, with one exception, they prefer a three-letter abbreviation—and in some cases more than three—when their names are abbreviated for publicity, advertising or other purposes.

Before last June, an airline agent had to be familiar with two codes—two letters for reservations and requesting interline space via teletype, and three letters for filling in routing blocks on tickets. Thus, United Air Lines was UA for reservations and UAL for ticketing. Some errors and mixups occurred.

The two-letter code for reservations has been in use for several years. To achieve uniformity, members of the Air Traffic Conference voted last year to switch from three to two letters for their "official carrier abbreviations," i.e., ticketing. This meant that members would use the same code for both reservations and ticketing.

The two-letter code applies only to full ATC members. Associate members are not bound by the resolution. For example, Pan American World Airways is PA for reservations activity, btu PAA for ticketing and other uses.

It was understood at the time of the ATC vote that airlines were not to be precluded from using contractions of their corporate names for advertising, publicity, and other purposes. And the AMERICAN AVIATION survey showed that, with one exception, the airlines do not believe a two-letter abbreviation is sufficient for these purposes. The exception is American Airlines, which for years has been known as AA. North Central goes to the other extreme and never abbreviates. Its natural abbreviation, NCA, was being used by Northern Consolidated Airlines.

That some carriers feel strongly about proper abbreviation is seen from TWA's answer: "We would take a very dim view of abbreviating TWA to TW for any advertising or publicity purposes even though the two-letter form is now official for reservations and ticketing. We are perfectly happy with TWA and the more we see it in advertising and publicity the better."

As a service to its readers, AMERICAN AVIATION herewith publishes the official reservations-ticketing abbreviations and the abbreviations preferred by airlines for other purposes.

Official airline abbreviations

	Reservations Code and Official Carrier Abbreviation	Preferred Abbreviation for Publicity and Other Purposes
Allegheny Airlines	AL	AAA
American Airlines	AA	AA
Bonanza Air Lines	BL	BAL
Braniff Airways	BN	BNF
Capital Airlines	CA	CAP
Central Airlines	CN	CEN
Chicago Helicopter Airways	CH	CHA
Continental Air Lines	CO	CAL
Delta Air Lines	DL	DAL
Eastern Air Lines	EA	EAL
Ellis Air Lines	ES	ELS
Flying Tiger Line	FT	FTL
Frontier Airlines	FL	FAL
Lake Central Airlines	LC	LCA
Los Angeles Airways	LX	LAA
Mackey Airlines	MK	MAK
Mohawk Airlines	MO	MOH
National Airlines	NA	NAL
New York Airways	NY	NYA
North Central Airlines	NO	North Central
Northeast Airlines	NE	NEA
Northern Consolidated Airlines	NC	NCA
Northwest Airlines	NW	NWA
Ozark Air Lines	OZ	OZA
Pacific Northern Airlines	PN	PNA
Piedmont Airlines	PI	PAI
Slick Airways	SI	SLI
Southern Airways	SO	SOU
Southwest Airways	SW	SWA
Trans-Texas Airways	TT	TTA
Trans World Airlines	TW	TWA
United Air Lines	UA	UAL
West Coast Airlines	WC	WCA
Western Air Lines	WA	WAL

Associate members of ATC are not bound by the resolution adopting a two-letter code for both reservations and ticketing. They retain a three-letter code, except in the case of Panagra, for official carrier abbreviation, i.e., ticketing. Their codes follow:

	Reservations Code	Official Carrier Abbreviation	Preferred for Other Purposes
Alaska Airlines	AS	ASA	ASA
Canadian Pacific Air Lines	CP	CPA	CPA
Caribbean Atlantic Airlines	CB	CBA	Caribair
Pan American World Airways	PA	PAA	PAA
Pan American-Grace Airways	PG	Panagra	Panagra
Resort Airlines	RA	RAL	RAL
Riddle Airlines	RD	RID	RID
Trans-Canada Air Lines	TC	TCA	TCA
Wien Alaska Airlines	WE	WEN	Wien

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Selected Airline Expendi

Company	Total Assets 1956	Total Assets 1955	Shop and Servicing Supplies 1956	Shop and Servicing Supplies 1955	Passenger Food Expense 1956	Passenger Food Expense 1955	Other Passenger Supplies 1956	Other Passenger Supplies 1955
Aerovias Sud	$ 1,106,047	$ 873,781	$ 117	$ 1,141	.....	.....	.....	.....
Alaska	3,572,538	2,481,816	20,760	23,312	$ 67,934	$ 54,365	$ 10,750	$ 8,361
Alaska Coastal	801,399	776,556	14,838	15,261	.....	.....	67	44
Allegheny	3,606,094	2,983,250	48,343	30,763	18,043	6,250	12,223	4,954
American	231,732,206	203,012,346	1,819,801	1,395,768	7,562,971	6,431,067	1,572,132	1,185,829
Bonanza	1,546,036	1,274,036	15,224	13,389	10,122	5,635	8,861	6,166
Braniff	44,050,972	31,700,762	273,214	240,993	1,944,061	1,487,413	282,935	232,840
Byers	88,536	103,448	647	494	.....	.....	45	45
Capital	76,203,316	29,070,053	409,739	332,324	2,141,998	1,477,518	454,350	362,541
Caribbean	1,099,228	939,273	8,565	7,537	1,357	2,638	1,710	1,150
Central	1,354,675	1,163,715	6,888	11,544	9,853	8,963	4,952	4,275
Chicago Helicopter	1,335,718	536,296	9,368	8,507	.....	.....	.....	.....
Colonial*	.....	3,942,873	28,044	41,080	175,039	243,263	48,250	67,654
Continental	18,574,901	13,278,574	116,906	89,322	370,623	316,525	39,725	40,503
Cordova	663,962	391,085	5,807	5,206	2,650	1,937	1,412	1,113
Delta	39,320,094	34,209,630	613,757	535,529	1,606,009	1,539,267	238,065	183,554
Eastern	196,173,477	156,893,772	1,112,904	962,028	5,410,886	4,373,450	1,031,588	790,859
Ellis	746,948	712,084	6,857	3,431	.....	.....	36	.....
Flying Tigers	34,312,852	18,562,565	93,799	89,300	18,921	64,650	3,636	6,678
Frontier	1,711,348	1,996,215	32,230	40,288	26,150	21,026	17,126	21,156
Hawaiian	4,061,405	3,933,383	39,635	31,147	13,233	6,168	17,761	19,050
Lake Central	1,133,756	963,078	10,443	830	26,775	5,934	5,206	1,700
Los Angeles	800,168	990,206	1,802	2,136	.....	.....	3	3
Mackey	1,756,886	1,560,383	12,526	9,915	3,582	2,300	1,191	1,270
Mohawk	5,179,998	3,989,671	41,654	29,374	19,986	3,571	10,026	2,574
National	43,518,755	37,309,806	281,476	279,638	1,194,906	1,037,131	179,030	160,679
New York Airways	2,681,997	2,596,107	13,693	7,520	.....	.....	.....	.....
North Central	3,636,963	2,900,073	21,419	22,334	12,916	23,073	13,719	5,955
Northeast	8,792,835	7,181,426	84,252	75,821	178,994	194,323	38,376	36,014
Northern Consol.	1,456,433	1,230,522	15,742	13,774	12,498	6,991	2,560	2,114
Northwest	57,319,508	51,274,826	574,908	441,775	1,994,991	1,335,133	310,726	209,245
Ozark	2,959,353	2,097,436	40,250	26,434	8,307	3,072	8,129	6,271
Pac. Northern	7,349,386	3,271,066	43,786	31,680	213,103	151,206	15,503	17,401
Panagra	27,229,413	25,849,333	85,782	86,231	321,461	298,408	206,455	185,765
Pan American	285,358,264	254,146,130	.....	.....	.....	.....	.....	.....
Alaska	.....	.....	30,602	23,265	180,085	170,836	32,960	35,510
Atlantic	.....	.....	419,053	361,234	2,146,868	1,863,889	938,911	722,563
Latin American	.....	.....	873,879	730,869	1,946,594	1,446,246	623,037	483,396
Pacific	.....	.....	418,889	313,122	1,121,518	941,511	426,440	287,985
Non-divisional	.....	.....	.....	.....	.....	.....	.....	.....
Piedmont	3,736,068	3,930,372	29,768	13,227	21,989	19,897	21,585	16,238
Reeve	564,226	454,643	3,149	1,560	8,923	4,968	1,696	867
Resort	2,498,467	2,861,385	133	8,163	.....	17,638	17	1,699
Riddle	10,903,901	5,696,607	52,287	15,300	.....	.....	.....	.....
Seaboard & Western	11,549,868	.....	804	.....	344,998	.....	32,830	.....
Slick	17,685,574	7,796,872	277,360	163,864	170,344	98,255	40,516	7,952
Southern	1,643,212	1,322,007	23,485	26,157	7,019	8,063	5,921	5,294
Southwest	3,970,656	2,958,067	31,662	26,377	4,812	105	3,353	2,233
Trans Pacific	735,283	630,967	6,139	6,390	1,878	1,944	6,255	4,069
Trans-Texas	2,061,241	1,646,112	27,123	14,631	20,332	18,179	8,363	5,943
TWA	180,383,784	137,518,094	1,682,483	1,204,054	5,346,741	4,794,406	835,769	713,538
United	214,356,561	201,697,784	2,134,309	1,796,031	4,321,962	4,210,869	1,446,501	1,332,867
Western	30,716,711	24,499,320	162,447	163,969	1,063,946	1,122,674	218,301	179,304
West Coast	2,055,207	1,617,178	19,209	14,096	4,351	5,165	5,143	5,039
Wien Alaska	2,003,940	1,560,984	14,166	35,002	24,556	17,263	7,233	6,464
TOTALS	$1,606,159,047	1,233,183,337	12,204,588	9,796,154	39,329,806	33,578,154	9,199,028	7,494,427

* *Colonial Airlines figures are through May, 1956. Company then merged with Eastern.*

Industry Assets Top $1.6 Billion; Payroll

Substantial cost increases in a number of important categories were shown by the U.S. airlines in 1956.

At the same time, the industry's total assets rose 20.3% to an all-time high of $1,606,159,047.

Statistics compiled by AMERICAN AVIATION from Civil Aeronautics Board reports for the year ended Sept. 30, 1956, showed (for trunk, international, local service, all-cargo and territorial carriers):

Employes totaled 140,803, a 12.4% gain over 1955's 125,232.

Annual payroll jumped 15.6%, from $646,801,389 to $747,626,742.

Average wage was $5,310, up 2.8% from 1955's $5,165.

Expenses connected with passenger service continued to increase substantially.

The industry spent $39,329,806 on food, compared with $33,578,154 in 1955, a 17.1% increase. Other passenger supplies—blankets, dishes, linen, sleeper bags and numerous other items—cost $9,199,028. This was an increase of 23.9%.

Increased advertising and promotional efforts were also seen in the $26,416,242 spent for newspaper and magazine advertising space, a 10.5% gain from $23,905,316 the year before. Also higher were advertising expenses other than the purchase of space—displays, posters, calendars, novelties, maps, etc. This figure rose 17.5% from $13,977,276 to $16,416,535.

Shop and servicing supplies cost 24.6% more—$12,204,588 against $9,796,154. This was the biggest jump in any of the selected expense categories.

tures for 1955 and 1956

Advertising Space 1956	Advertising Space 1955	Other Advertising 1956	Other Advertising 1955	Employment 1956	Employment 1955	Annual Payroll 1956	Annual Payroll 1955	Average Wage 1956	Average Wage 1955	Company
$ 15,331	$ 10,161	$ 11,068	$ 2,087	121	85	$ 624,379	$ 421,819	$5,160	$4,963	..... Aerovias Sud
66,588	25,158	36,147	56,952	426	386	2,773,534	2,417,854	6,511	6,231	..... Alaska
4,630	4,116	3,839	6,121	103	117	640,718	707,042	6,221	6,043	..... Alaska Coastal
83,366	129,730	54,761	25,936	657	636	3,337,085	3,274,435	5,110	5,231	..... Allegheny
3,431,760	3,293,594	2,113,033	1,640,321	20,288	18,266	114,028,164	98,598,176	5,620	5,397	..... American
40,517	23,577	38,514	23,417	266	274	1,522,524	1,344,234	5,092	4,897	..... Bonanza
964,677	673,942	404,277	347,818	4,461	4,054	22,092,106	19,840,368	4,952	4,894	..... Braniff
748	1,139	1,593	1,460	5	6	33,500	42,500	6,700	7,083	..... Byers
973,978	902,015	477,425	236,000	6,561	4,988	32,370,732	25,046,791	4,919	5,021	..... Capital
9,159	6,228	16,510	11,025	195	189	686,916	630,831	3,523	3,337	..... Caribbean
13,267	24,107	11,397	20,414	373	370	1,819,201	1,664,755	4,877	4,499	..... Central
65	.....	.....	.....	64	46	343,937	274,916	5,374	5,727	...Chicago Helicopter
130,763	270,134	83,194	122,823	.....	840	.....	4,412,809	....	5,253	..... Colonial*
277,328	216,875	197,029	188,740	1,380	1,406	7,300,185	7,379,044	5,256	5,248	..... Continental
3,726	5,436	5,895	4,830	75	49	593,676	346,827	7,916	7,078	..... Cordova
1,328,276	922,232	413,477	370,921	5,446	4,847	27,332,421	22,525,130	5,019	4,647	..... Delta
3,854,176	3,463,400	660,682	649,081	13,730	11,356	73,176,773	59,425,028	5,329	5,232	..... Eastern
15,417	14,407	2,177	4,452	99	93	559,984	558,108	5,656	6,001	..... Ellis
64,819	66,244	39,124	28,448	1,339	1,333	8,056,046	7,425,347	6,016	5,570	..... Flying Tigers
73,245	63,961	109,161	100,189	702	658	3,555,723	3,326,067	5,065	4,918	..... Frontier
44,404	35,926	62,107	47,397	520	526	2,748,766	2,726,347	5,286	5,183	..... Hawaiian
1,922	5,710	6,022	9,816	349	306	1,555,932	1,417,231	4,458	4,631	..... Lake Central
3,185	1,851	852	2,624	101	84	504,741	403,127	4,996	4,799	..... Los Angeles
20,869	16,397	1,984	6,000	not filed		not filed	not filed	not filed		..... Mackey
39,001	24,212	31,010	56,773	906	483	3,016,108	2,476,986	4,951	5,138	..... Mohawk
1,422,376	1,297,993	636,662	457,393	3,310	3,040	15,710,919	15,051,088	4,747	4,951	..... National
2,955	2,420	8,251	11,349	157	115	890,963	620,581	5,675	5,396	...New York Airways
69,681	75,317	74,063	76,265	966	825	4,999,418	3,923,815	5,165	4,756	..... North Central
111,383	137,927	101,081	145,828	1,133	1,062	5,838,936	5,349,288	5,151	5,037	..... Northeast
17,197	8,200	6,516	11,572	178	106	1,227,150	756,969	6,894	7,027	... Northern Consol.
1,343,904	1,376,246	626,501	568,295	5,586	5,451	30,150,860	29,812,933	5,397	5,469	..... Northwest
42,034	25,027	42,851	19,459	681	509	3,120,656	2,457,742	4,582	4,829	..... Ozark
69,326	63,969	27,327	32,535	589	566	3,466,396	3,353,673	5,885	5,923	..... Pac. Northern
699,509	674,609	236,231	202,005	1,330	1,403	4,326,523	4,284,658	3,093	3,054	..... Panagra
.....	.....	.....	.....	.....	.....	.....	.....	....	....	..... Pan American
39,282	72,527	75,503	112,734	409	397	2,838,796	2,662,206	6,941	6,706	..... Alaska
1,919,264	1,366,032	1,431,461	1,636,651	6,515	5,785	32,376,324	28,975,296	4,970	5,009	..... Atlantic
1,185,644	1,073,978	1,240,521	1,183,580	7,985	7,060	37,961,093	32,660,424	4,753	4,626	... Latin American
837,278	676,823	818,284	676,050	4,260	3,904	23,452,314	19,223,484	5,505	5,331	..... Pacific
.....	.....	.....	.....	2,161	2,100	9,859,500	9,636,924	4,563	4,589	.... Non-divisional
138,287	132,563	95,563	105,243	840	745	4,058,971	3,344,492	4,829	4,489	..... Piedmont
4,189	2,455	3,552	3,163	54	46	395,762	344,347	7,329	7,486	..... Reeve
6,231	39,581	.....	27,047	122	not filed	979,812	.....	8,031	....	..... Resort
24,128	7,165	15,532	14,158	714	268	3,529,506	1,249,016	4,943	4,661	..... Riddle
.....	.....	90,000	.....	720	.....	4,413,310	.....	6,130	....	.. Seaboard & Western
44,235	6,412	20,470	5,081	1,716	1,417	10,109,235	6,487,776	5,891	4,578	..... Slick
48,389	29,853	43,736	32,090	477	434	2,246,366	1,986,373	4,709	4,577	..... Southern
67,646	30,691	93,590	79,780	402	393	2,302,049	2,060,094	5,726	5,206	..... Southwest
16,513	17,564	27,634	15,543	252	218	1,163,736	1,031,504	4,618	4,732	..... Trans Pacific
103,574	69,506	57,707	56,694	674	537	3,150,001	2,444,690	4,674	4,553	..... Trans-Texas
3,013,487	2,353,294	3,435,994	2,726,809	19,620	17,082	103,975,534	89,382,460	5,299	5,232	..... TWA
3,060,010	2,501,306	2,126,023	1,558,965	19,023	18,130	109,508,272	98,210,731	5,756	5,420	..... United
579,201	545,097	229,563	183,686	2,266	2,122	12,276,145	11,005,450	5,418	5,187	..... Western
46,149	22,903	57,033	62,874	419	405	2,280,696	2,156,441	5,443	5,329	..... West Coast
12,641	13,489	13,928	8,023	302	230	2,343,315	1,710,160	7,759	7,435	..... Wien Alaska
26,416,242	23,905,316	16,416,535	13,977,276	140,803	125,232	747,036,742	646,801,389	5,310	5,165	..... TOTALS

Jumps 15.6%, Employment Up 12.4%

The year saw one carrier, Colonial, drop out of the picture through merger with Eastern Air Lines. But another, Seaboard & Western, was added in April, when it started certificated all-cargo service across the Atlantic.

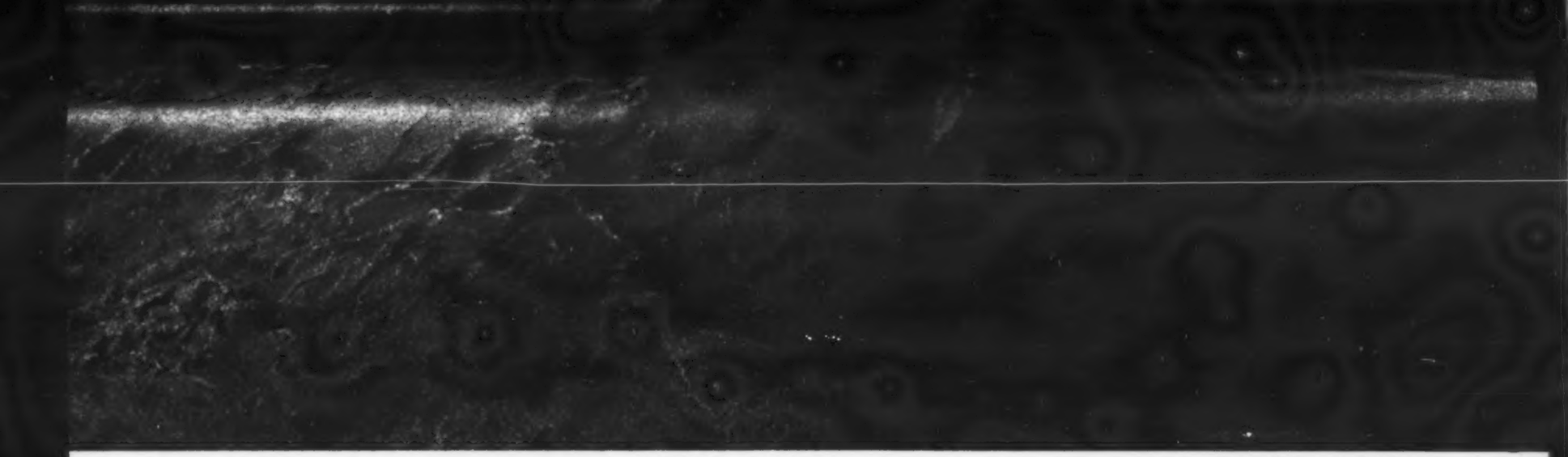
Addition of airplanes to the fleets boosted the assets of a number of carriers. For example, Capital Airlines, taking delivery on its fleet of Viscounts, rose 162% in the asset column, from $29,070,053 to $76,203,316. Slick increased 125%, Eastern 25%, TWA 14.5%.

Four airlines went over the $100 million mark in annual payroll—American, $114,028,164; United, $109,508,272; Pan American World Airways (all divisions plus headquarters), $106,478,028, and TWA, $103,975,534.

The 15.6% increase in the industry's annual payroll compared with a 14.9% gain in 1955 over 1954, while the 12.4% employment increase compared with 11.3%. In the last five years, payroll has jumped 59.1%, employment 33.5% and average wage 19.3%.

In the same five years, the cost of passenger food has risen from $21,897,837 to $39,329,806, or 79.6%. First-class passenger-miles increased only 29.6% in the same period. Coach flights showed a much larger gain, but these flights incur little passenger service expense.

Increased traffic, higher prices and more elaborate service have caused higher food expense. In the last two years another contributing factor has probably been the serving of free alcoholic beverages on some flights. Liquor expense is believed to be listed in the food account.



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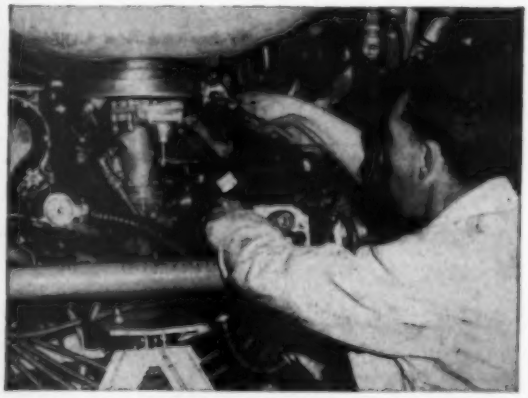

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Airline growth: strong in traffic, weak in earnings

Operating expenses gained faster than gross revenue, so net income in 1956 was 5% lower than it was in 1951

by Selig Altschul

AIRLINE OPERATIONS present a persistent study in contrasts—a condition that has been sharply accentuated by recent events. New peaks in passenger volume and gross revenues have been a regular occurrence in a steady pattern, with the monotony tempered only by the degree of gain being recorded.

Operating earnings and net income, on the other hand, have not only fallen far short of matching this pace but have in fact gone into a decline.

This is an ironic phenomenon in a growth industry where rising volume is normally expected to bring leverage into play and exercise a favorable impact upon earnings. In other words, once the break-even point is reached, the bulk of subsequent increases in gross revenues is normally expected to flow through to net operating income. This has not happened in the air transport industry because of the continuing squeeze on profit margins.

Stated differently, the industry has had to generate substantial gains in gross merely to hold its ground in earnings. Last year earnings actually declined in the face of an increase of almost 13% in passenger traffic.

These trends are highlighted in the table of operations and earnings accompanying this article. It can be seen that the domestic trunk airlines increased their capacity in passenger seat miles alone by more than 130% in 1956 over 1951, with actual revenue passenger miles gaining 112% during this period.

Largely as a result of the shift to coach travel and reductions in mail and cargo rates, gross revenues were up around 92%. Operating expenses, however, gained even faster—some 110% which served to place 1956 net operating income about 5% below that of 1951. Only the incidence of capital gains (which in a broad measure are a return of capital and not earnings) placed net income in 1956 higher than for 1951 and then only by 32%.

Comparison of 1956 results with that of 1955 point up much more sharply the deterioration of earnings that has taken place as a result of declining profit margins.

The airlines now have before the Civil Aeronautics Board a series of passenger fare proceedings which are intended to examine the economic health of the industry. Based on the record, the airlines strongly believe that they are entitled to an emergency 6% fare increase immediately and which they presumably hope to make permanent after the general passenger fare investigation is completed.

On the other hand, the Bureau Counsel of the CAB opposes this position and at the very least is presumed to desire to hold the fare line if not even effect further reductions.

While the separate positions are being advanced and heard in the CAB regulatory arena, realistic investment judgment as to the airlines has been quick to reflect itself in the marketplace.

Investors have seen the figures and established the facts in the continuous "hearing" they accord the airlines and all other industry groups.

The evidence of deteriorating profit margins and declining earnings has led to a flight from airline securities. Investment trusts are known to have been heavy sellers of airline equities. This has been clearly established by an examination of 1956-year end portfolio changes.

Market quotations tell their own story as to what happened to the price of airline equities in recent periods. Market trends of all listed common stock of the trunk airlines are shown in another table presented on these pages. As the industry was developing its record earnings of 1955, airline equities established their best prices during that year since the recovery from the heavy post-war losses in the 1946-1948 period.

Nevertheless, encouraging as the 1955 highs may have been, with the exception of the common stocks of Eastern and American, market quotations that year for airline equities fell far short of the all-time highs established in 1945 and 1946. In that period of more than ten years ago, market quotations appeared to anticipate an era of rising and sustained earnings. And for a growth industry this was a perfectly normal anticipation. That expectation was not borne out by operating results and market evaluations for airline equities consequently sought a much lower plateau.

Prices are currently down sharply for most airline equities from the 1956 year-end. However, even at their 1955 peaks, the equities of Braniff, Conti-

Trend of operations and earnings of domestic trunk airlines, 1951-1956

(In millions)

	1951	1955	1956 (p)	% Increase or decrease for 1956, compared with: 1951	1955
Available Seat Miles	14,672	29,979	33,753	130.1	12.6
Revenue Passenger Miles	10,211	19,205	21,643	112.0	12.7
Operating Revenues					
Passenger	$ 570.	$1,022	$1,142	100.3	11.7
Mail, Cargo & Other	89	111	121	36.0	9.0
Total	659.	1,133	1,263	91.7	11.5
Total Operating Expenses	553	1,010	1,162	110.1	15.0
Net Operating Income	106	123	101	(4.7)	(17.9)
Net Income	43.5	63.1	57.4	(32.0)	(9.0)

Note: p-preliminary.

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Market trends of common stocks of domestic trunk airlines, 1955-1957

	1955 high	1955 close	1956 close	3/29/57 close	% Decline 3/29/57 from 1955 high	% Decline 3/29/57 from 1956 close
American	29⅛	24	23⅜	18	38.2	23.0
Braniff	18⅞	14½	11⅛	9⅞	47.7	11.2
Capital	42¼	39⅞	24⅞	20⅞	50.6	16.1
Continental ..	15⅝	12	11⅝	10⅜	33.6	10.8
Eastern	58	50	49¾	37	36.2	25.6
National	27⅞	23⅞	27¾	20½	26.5	26.1
Northeast	12	10¼	10	7⅞	34.4	21.3
Northwest	26⅜	19⅛	17¼	15	43.1	15.0
Pan American.	22	17¼	18¾	15	31.8	20.0
TWA	35½	25¼	19	15½	56.3	18.4
United	49½	39½	42¾	28⅜	42.7	33.6
Western	25¾	22	24¾	22⅝	12.1	8.6

nental, Northeast, Northwest and Pan American, at that point, were selling about one-half of the all-time tops established more than ten years ago.

Most equities at March 29, 1957 are down from 31% to about 50% from their 1955 peaks. As prices began to slide somewhat during the second half of 1956, the losses from the 1956 year-end to March 29, 1957 were not quite so precipitate. For this shorter period, losses range from around 10% to the mid-20s.

As with all group market movements, there are wide variations among the individual companies. This is nothing more than a reflection of the individual fortunes of the separate airlines. For example, TWA, with a 56.3% decline (from the 1955 high) in the price of its equity merely reveals the consequences of deficit operations.

United's equity in declining some 33.6% during the first quarter of this year reflects the investment disappointment that accompanied the company's reduction of its cash dividend in favor of stock dividends. United has stated that it must conserve its cash resources to assist in financing such additional equipment acquisitions that may be made.

Nevertheless, by this action, an excellent record zealously cultivated throughout the years by one of the highest dividend payouts in the industry has now been blunted. Only a renewal of earnings leading to a sustained uptrend and the restoration of a steady dividend record can repair this investment damage. However, this dividend action on the part of United must be placed in proper perspective and viewed as a symptom of the times and the earnings position of the industry.

End of rapid tax writeoff hurt

A squeeze on airline profit margins is not the only reason for investment disenchantment with airline equities. Earlier this year, the Office of Defense Mobilization terminated the issuance of tax amortization certificates for new air transports. The consequences of this move were discussed in this space earlier this year, (AMERICAN AVIATION, January 28, 1957, p. 34). Something like $1.4 billion of new aircraft now on order have, for the moment, been shut out of fast tax amortization. If granted, such certificates permit the carriers to write off their new equipment at 80% of their cost within five years. In the absence of this amortization credit, most airlines would merely take depreciation over a seven-year period with a 10% residual.

This fast write-off authorization was designed to encourage the airlines —and other industry groups—to increase and modernize capacities in the national defense interest. This "quickie" write-off by no means represents a forgiveness but merely serves to postpone the date of tax payments. Such tax credits have served to swell the cash flow generated through depreciation charges.

Write-offs a big factor

As first indicated here, during the past three years the entire domestic trunk airlines generated a total cash flow of more than $600 million from all sources. Depreciation, however, generated some 54% of this amount. Rapid tax write-offs were quite a factor in this showing and would have been even more important in generating cash on the new equipment now on order.

This cash generated through this means was an integral element in the financing plans of many airlines in the acquisition of their new equipment. In a tight money market and with balanced capital structures, the loss of this tax credit poses a serious threat to a number of airline financing programs.

The airlines and the Defense Air Transportation Administration, the agency delegated to recommend tax amortization certifications for the air carrier industry, are making a determined effort to restore the "quickie" write-off for the new equipment now on order. Success in that direction will not only ease the cash strain in the financing plans for a number of carriers but will also help re-kindle investment support in the industry.

Of lasting significance, however, is the fact that the airlines are in need of much improved profit margins. Maintenance of healthy profit margins will restore earning power in the industry and with it investment support should be attracted.

Scheduled Airline Revenues and Expenses, 1956-1955

	Passenger Revenues 1956	Passenger Revenues 1955	Freight Revenues 1956	Freight Revenues 1955	Express Revenues 1956	Express Revenues 1955	Mail Revenues 1956	Mail Revenues 1955	Total Operating Revenues 1956	Total Operating Revenues 1955	Total Operating Expenses 1956	Total Operating Expenses 1955	Net Operating Income 1956	Net Operating Income 1955
DOMESTIC														
American	$ 255,530,721	$ 227,505,952	$15,119,190	$14,631,865	$ 3,983,188	$ 4,461,329	$ 6,733,672	$ 5,839,667	$ 285,522,718	$ 255,390,974	$ 249,514,934	$ 217,004,569	$ 36,007,784	$ 38,386,405
Braniff	41,338,678	36,245,709	1,135,405	1,003,638	604,742	555,521	1,148,987	934,383	45,183,996	39,535,356	41,769,323	35,665,138	3,414,673	3,870,218
Capital	59,667,034	45,897,106	1,071,220	1,172,259	880,474	1,155,292	1,247,096	1,217,250	63,706,744	50,849,876	66,662,812	50,355,795	—2,956,068	494,081
Caribair	1,448,882	1,157,502	52,165	42,126	.....	.....	21,111	17,993	1,628,119	1,335,543	1,382,480	1,293,456	245,639	42,087
Colonial*	2,624,204	6,969,932	69,952	155,718	18,402	41,304	39,937	77,154	2,990,454	7,787,265	3,121,035	7,921,645	—130,581	—134,380
Continental ..	16,279,033	13,790,391	429,489	410,519	138,116	134,746	437,739	374,191	18,548,127	16,082,839	17,314,139	15,137,536	1,233,988	945,303
Delta	61,116,636	52,843,394	1,876,530	1,767,287	1,112,745	975,291	1,515,540	1,289,761	67,138,267	57,871,530	60,784,023	50,439,076	6,354,244	7,432,454
Eastern	199,849,392	174,822,644	2,881,248	2,726,326	2,033,985	2,264,626	3,846,294	3,625,045	213,332,223	187,898,687	188,119,124	163,141,268	25,213,099	24,757,419
Hawaiian	4,148,761	3,896,692	704,599	677,849	.....	.....	42,062	37,162	5,324,391	5,092,468	5,147,259	5,355,826	177,132	—263,358
National	48,053,185	43,073,773	1,287,786	1,097,500	271,853	299,154	1,015,130	514,266	53,166,640	46,965,119	44,485,331	39,693,187	8,681,309	7,271,932
Northeast	8,138,375	7,938,798	183,221	220,494	96,118	96,362	112,954	131,247	10,300,171	10,120,300	10,728,571	9,971,913	—428,400	1,148,387
Northwest	45,239,643	44,555,282	2,153,797	1,909,291	966,913	976,006	1,613,460	1,575,290	50,907,638	50,006,229	48,549,427	45,346,044	2,358,211	4,660,185
Trans-Pacific**	1,893,933	1,789,406	76,948	75,194	.....	.....	9,588	10,656	2,106,340	2,021,591	2,158,622	1,980,148	—52,282	41,443
TWA	158,928,474	135,089,655	5,074,814	5,065,452	3,252,786	2,851,975	4,235,447	4,326,467	174,399,897	149,954,417	178,084,806	134,189,828	—3,684,909	15,764,589
United	219,183,354	196,705,404	10,433,254	8,642,182	4,370,430	4,825,308	8,877,090	7,042,477	249,446,505	222,128,046	227,511,383	201,221,528	21,935,122	20,906,518
Western*** ..	26,249,113	28,755,616	457,150	653,823	296,765	343,492	775,481	862,014	28,187,773	31,039,523	25,585,475	26,648,756	2,602,298	4,390,767
TOTAL ..	1,149,689,418	1,021,037,256	43,006,768	40,251,323	18,026,517	18,980,406	31,671,588	27,875,023	1,271,890,003	1,134,079,763	1,170,918,744	1,005,365,713	100,971,259	129,714,050
INTERNATIONAL														
American	4,840,517	4,472,333	722,864	535,871	2,490	1,554	54,716	50,501	5,930,148	5,365,683	5,157,123	4,471,643	773,025	894,040
Braniff	5,363,032	5,666,482	341,506	399,499	.....	.....	164,677	242,925	7,538,211	7,263,294	6,663,152	7,761,511	875,059	—498,217
Colonial*	636,907	1,566,843	6,499	19,176	.....	.....	2,278	8,354	703,052	1,720,141	746,184	1,660,617	—43,132	59,524
Delta	4,793,819	4,045,885	169,475	207,185	.....	.....	54,841	49,742	5,205,617	4,455,229	4,658,193	4,807,518	547,424	—352,289
Eastern	13,528,640	9,519,127	305,912	207,745	.....	.....	272,758	295,206	14,717,776	10,710,406	11,131,233	8,737,312	3,586,543	1,973,094
National	3,667,179	3,569,357	84,996	131,027	17,729	15,880	39,303	39,592	3,969,561	3,899,541	3,686,714	3,902,419	282,847	—2,878
Northwest	15,024,648	12,697,675	3,214,571	2,594,605	61,215	59,193	5,578,678	4,937,556	25,764,844	21,357,267	23,529,812	21,600,818	2,235,032	—243,551
Panagra	14,752,872	14,108,687	1,575,756	1,130,436	.....	.....	432,555	306,771	20,004,535	17,979,301	18,467,107	17,071,332	1,537,428	907,769
Pan American														
Latin Amer.	62,791,746	55,300,000	10,705,848	9,423,000	.....	.....	2,072,053	1,821,000	88,038,881	(1)	85,318,397	(2)	2,720,484	(3)
Atlantic ...	95,182,123	77,467,000	8,706,819	7,174,000	.....	.....	6,798,457	5,943,000	121,933,522	(1)	109,992,001	(2)	11,941,521	(3)
Pacific	52,533,380	42,800,000	6,276,774	5,260,000	.....	.....	5,689,579	6,656,000	71,545,655	(1)	63,589,977	(2)	7,955,678	(3)
Alaska	4,198,755	4,161,000	864,135	897,000	.....	.....	220,814	193,000	6,993,589	(1)	7,814,530	(2)	—820,941	(3)
TWA	51,350,949	47,188,472	3,586,231	3,638,160	.....	.....	5,106,240	4,626,666	65,842,242	60,736,760	66,319,997	59,293,806	—477,755	1,442,954
United	12,437,494	11,106,820	168,240	192,779	.....	.....	415,957	448,940	13,344,114	11,962,537	11,072,656	9,623,057	2,271,458	2,339,480
TOTALS ..	341,102,061	293,669,681	36,629,626	31,810,483	81,434	76,627	26,902,906	25,619,253	451,531,747	382,967,159	409,147,076	364,310,233	33,384,671	18,656,926
LOCAL SERVICE														
Allegheny ...	4,309,878	3,646,297	49,275	.....	124,019	110,088	89,275	95,129	6,595,634	5,551,508	6,892,899	5,748,249	—297,065	—196,741
Bonanza	1,662,500	1,356,670	39,844	28,952	21,704	15,516	35,185	38,329	3,170,484	2,400,878	2,965,406	2,427,400	205,078	—26,522
Central	1,167,558	875,515	36,240	33,024	14,427	11,020	39,963	77,223	3,382,090	3,144,371	3,381,600	3,049,659	490	94,712
Frontier	3,162,235	2,506,938	226,848	211,339	37,216	36,029	116,982	119,944	6,148,592	5,522,740	5,925,858	5,469,394	222,734	53,355
Lake Central	1,315,970	1,048,610	.....	.....	70,566	70,666	26,035	69,197	2,784,963	2,598,046	2,780,821	2,585,434	4,142	12,612
Mohawk	4,377,600	3,391,387	78,903	55,020	50,266	33,493	53,884	43,392	5,734,572	4,307,476	5,908,736	4,318,126	—174,164	—10,650
N. Central ...	6,124,180	4,901,381	.....	.....	149,640	126,476	191,157	187,704	7,941,076	6,790,079	7,905,360	6,598,980	35,716	191,099
Ozark	3,080,396	2,271,816	58,926	.....	69,292	68,069	105,340	96,719	5,773,367	4,300,198	5,881,170	4,360,369	—107,803	—60,171
Piedmont	4,780,179	4,333,828	65,876	76,937	67,897	53,285	103,595	88,732	7,455,108	6,406,532	7,627,852	6,397,708	—172,744	8,824
Southern	1,945,889	1,660,644	.....	.....	59,814	56,478	87,362	106,860	3,948,578	3,567,291	3,980,026	3,471,414	—31,448	95,877
Southwest ...	3,129,855	2,781,027	46,000	51,350	40,593	33,799	102,496	74,259	4,818,004	4,227,688	5,099,984	4,067,493	—281,980	160,195
Trans-Texas ..	2,990,254	2,106,091	108,518	62,701	50,110	33,164	110,937	139,101	5,983,231	4,866,352	5,946,357	4,616,206	36,874	250,146
West Coast ..	2,119,465	1,940,122	35,738	35,593	18,671	15,552	45,255	48,207	3,994,934	3,538,190	3,860,836	3,739,209	134,096	—201,019
TOTALS .	40,165,959	32,820,326	746,168	554,916	774,215	663,635	1,107,466	1,184,796	67,730,633	57,221,358	68,156,705	56,849,641	426,072	371,717
HELICOPTER MAIL SERVICE														
Chi. Helicopter	4,305	.....	.....	.....	.....	.....	74,413	73,420	631,355	513,709	633,354	461,176	—1,999	52,533
Los Angeles ..	116,368	29,153	.....	.....	89,188	70,982	125,969	137,050	1,046,826	1,092,399	1,110,252	934,521	—63,426	157,878
N.Y. Airways .	319,814	179,684	28,953	23,277	24,530	29,023	31,860	40,274	1,743,962	1,749,792	1,958,410	1,559,996	—214,448	189,796

** Colonial's 1956 figures are for five months; Colonial and Eastern merged effective June 1, 1956.*
*** Preliminary figures shown for Trans-Pacific Airlines.*
**** Western's operations suspended from January 9 to March 22, 1956, because of strike.*
(1) Pan American Airways listed total operating revenues for all four divisions combined, $237,517,000.
(2) Pan American Airways listed total operating expenses for all four divisions combined, $225,380,000.
(3) Pan American Airways listed net operating income for all four divisions combined, $12,137,000.

Jet sales competition shapes buyers' market

U.S. trunks will operate seven different makes, have more than two dozen models to choose from

by Joseph S. Murphy

WITH MORE THAN $2 BILLION in jet and turboprop orders on their books at the year-end, U.S. and foreign plane builders during 1956 turned the turbine transport sales competition into a buyers' market for the world's airlines.

And with a deaf ear to the experts of two or three years back, they erased all prospects that prohibitive jet development costs and a limited market would narrow the field of competing manufacturers.

As a result, U.S. scheduled trunk airlines alone are doing jet-age business with seven different manufacturers. Entering 1956 with commitments to Boeing, Douglas, Lockheed and Britain's Vickers Armstrongs, they placed orders for Convair 880s, DeHavilland Comets and Bristol Britannias, quickly swelling the roster of firms whose aircraft will be flying U.S. air routes in 1959 and 1960.

And the number of varying models offered by these seven producers overshadows anything ever demonstrated in the 22-year history of modern air transport development.

The 1947 picture of Boeing with a Stratocruiser, Douglas with a DC-6 and Lockheed with a Constellation has changed. Although still a good 18 months away from delivery of its first jet to Pan American, Boeing today has sold at least five distinctly different versions of the 707.

There's the —120 with a large fuselage PAA and American will receive, and a —120B with a short fuselage ordered by Qantas. A —220, for Braniff Airways, is a basic —120 but uses higher thrust Pratt & Whitney J75 engines in place of J57s.

The 707-320 is Boeing's Intercontinental airplane, J75-powered, with gross weights approaching 300,000 lbs. compared to about 247,000 for the —120. Another overseas version is the —420 using Rolls Royce Conway bypass engines instead of J75s.

But Boeing is no exception. Douglas has sold its DC-8s in four versions, domestic models using J57s or J75s, a bigger intercontinental model with J75s and a fourth version, for Trans-Canada Airlines, having the Conway bypass.

Britain's Vickers Armstrongs has two basic models of its Viscount turboprop already in operation, a third—the 800 series—enters service this year. The Viscount's successor, the Vanguard, makes it four for Vickers too.

This is only a start. There's the Lockheed Electra, Convair 880, Comet IV, France's Caravelle and Bristol Britannia also on the "sold" list. Add to these such advanced "paper" models as the Boeing 717 and 727, the Douglas DC-9 and two other versions

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But there are peacetime benefits, too. Avco-Crosley, for example, has assisted the Air Force Cambridge Research Center in the development of Volscan, a semi-automatic air traffic control system. Already tested by the U. S. Air Force, Volscan has proved its ability to almost triple airport landing capacities . . . to help solve today's mounting air traffic problems.

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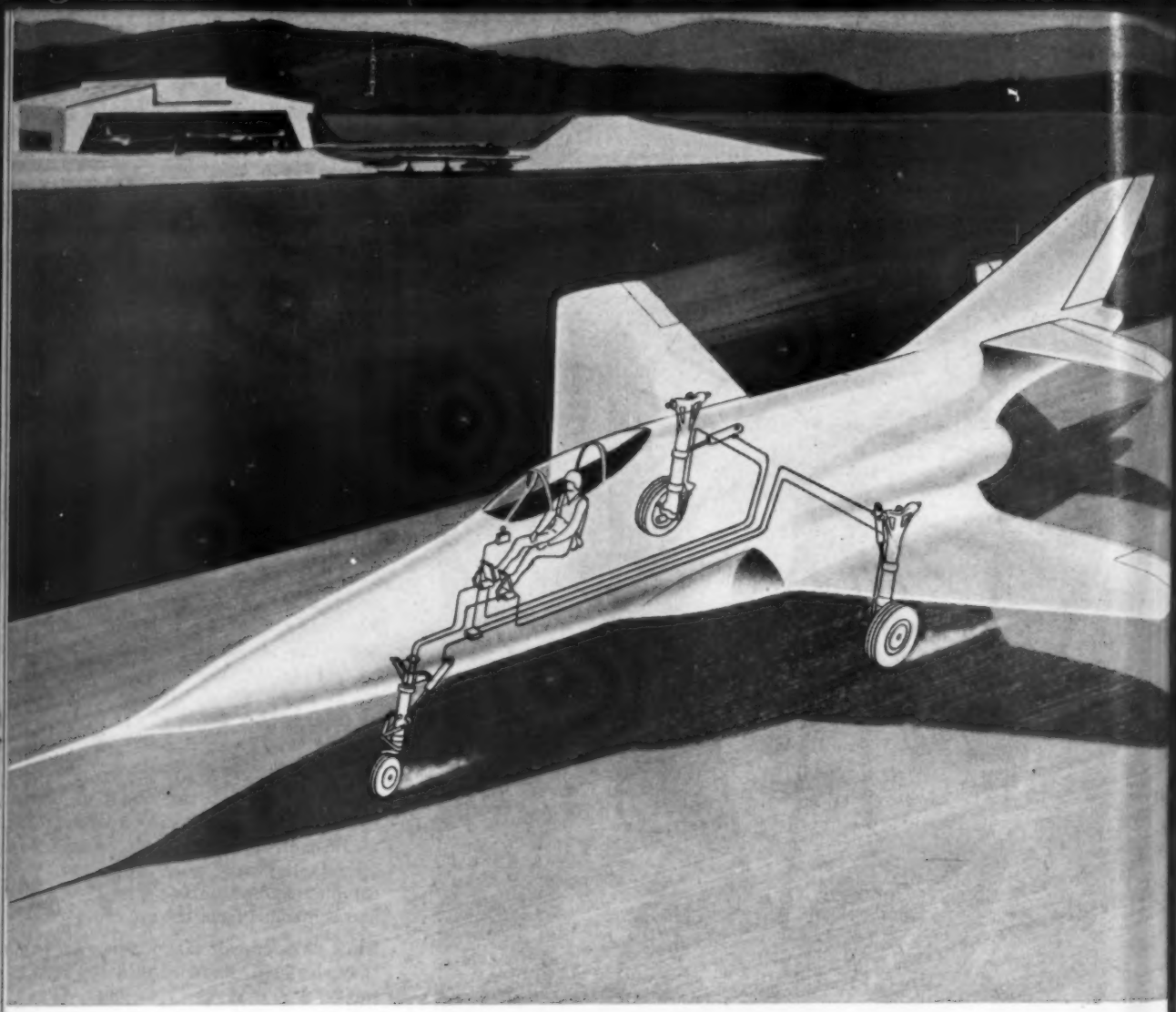

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of the Britannia and the choice widens to about two dozen.

Instead of a handful of lower-cost, "standardized" off-the-shelf type airplanes thought necessary in the expensive jet age, airlines are enjoying (but paying for) a "take your pick and name your model" buying proposition.

And with this inducement, U.S. carriers during 1956 expanded their commitments to $1.6 billions, including 238 jets and 211 turboprops, for a total of 449 aircraft.

Airline by airline, here's how the equipment picture shapes up:

American—has ordered 30 Boeing 707s using J57s with water injection at a cost of $135 million; 35 Lockheed Electras at $65 million plus $12.5 million for engines; total investment $212.5 million. Also holds option on 25 additional Electras.

Braniff—will get five 707s with J57 engines at $30 million and nine Electras at $22 million; total $52 million.

Capital—Is operating 59 Viscounts, will get 15 more for a total $82 million; ordered 14 DeHavilland Comets at $53 million, total $135 million.

Continental—only other U.S. Viscount buyer; will get 15 at $16.3 million, has optioned five others. Also ordered four 707s costing $21.3 million, total about $38 million.

Delta—Will be an all-jet operator. Orders are for eight DC-8s at about $37 million and 10 Convair 880s at near $50 million including spares; total $87 million.

Eastern—signed up for 40 Electras at $100 million and 20 DC-8s plus six on option for $165 million; total $265 million. Also holds option for 30 more Electras at about $65 million.

National—ordered six DC-8s at $36 million and 23 Electras at about $50 million, total $86 million.

Northeast—only U.S. airline to order Britannias to date. Is due to get five costing in excess of $17 million and is slated to become second turbine transport operator in U.S. when it introduces them late this year in New England-Florida service.

Pan-American—Only airline to order both Boeing 707s and Douglas DC-8s. Will get 25 DC-8s at $160 million and 23 707s at $135 million, total $295 million.

Panagra—has a $25-million order for four DC-8s, option for two others. First four are understood to be included in 25 DC-8s ordered by PAA.

TWA—only other U.S. all-jet operator. Initially ordered eight 707s at about $36 million, but later increased total to 33 at about $150 million. Final figure, however, has not been announced, although order was placed last year by Howard Hughes. TWA also will get 30 Convair 880s at estimated $150 million including spares. Total estimated investment, $300 million.

United—has ordered 30 DC-8s at $175 million. No commitment yet for medium-range jet or turboprop.

Western—holds order for nine Electras at $19 million, is not committed for any jets.

This leaves only Northwest to be heard from and that carrier can be expected to order about 10 DC-8s or 707s costing $50 million. It already has bought spare J75 engines and decision can be expected before this year runs out.

Except for Northwest, this line-up of equipment for the major carriers surely indicates the "first round" of jet and turboprop buying is nearing end. Significant is the fact that all but three carriers have chosen their airplanes for both their long-haul and medium-range operations.

Northeast, with its Britannias, lacks a short/medium range turbine, assuming the Bristol transport will be used in Boston-Miami and New York-Miami service exclusively. It, too, probably will be eyeing a large jet for long-haul competition when Eastern and National introduce their DC-8s.

Western has ordered Electras, but has made no commitment for jets. A long sought Mexican route award, now in its hands, could well change that and bring an order for up to five airplanes.

The big question mark surrounds United, a sure-fire prospect for either a medium-range jet or turboprop. An order here surely would fall in the area of 40 aircraft with options for more—some $100 to $125 million to the manufacturer that lands it.

And with this new pattern of equipment buying, competition on the major U.S. routes is headed for some radical changes.

A good example is transcontinental nonstop operation. Historically, it has been a case of American and United with almost identical Douglas equipment and TWA with Lockheeds. In the jet age, American will join forces with TWA operating Boeing 707s, while United assumes the role of lone DC-8 operator.

On other route segments, Braniff will be using J75-powered 707s competing with American using Boeings with J57s. New York-Chicago service probably will see all types of turboprops and jets represented, except perhaps the Britannia, based on present orders.

In the world competition for jet sales, the spotlight in 1956 shifted to Boeing Airplane Co. With only 62 707s sold on January 1, well behind Douglas DC-8 sales, the Seattle firm added five new carriers and garnered reorders from two others to boost its year-end total to about 134.

Orders came from TWA (8), Lufthansa (4), BOAC (15), Air India (3) and Qantas (7), with reorders by Sabena (1) and Pan American (3).

The big share of Boeing's jump into the lead, although ordered last year, remains unannounced and represents a 25-plane follow-on order by Howard Hughes for TWA.

This year to date Boeing has edged its total to 141 for an estimated $700 million commercial jet backlog.

Douglas, meanwhile, relinquished its lead in the jet race by landing only 27 new orders, bringing its year-end total to 122 valued at about $615 million.

But together, Boeing and Douglas have put together better than $1.3 million in jet orders—the dollar equivalent of about 650 DC-7s in terms of today's transports. And while sewing up this market, the Seattle and Santa Monica firms have been keeping their customers busy looking at proposals for smaller jets—apparently with the aim of keeping the Lockheed Electra and Convair 880 from gaining too strong a foothold in this other lucrative turbine sales field.

Their efforts in this direction, aided by a buying slowdown by carriers while they regroup their finances, has been fairly successful.

Although Convair has nailed down 44 firm orders for the 880 worth better than $200 million, it's a good bet it will have to sell almost double that number to hurdle the breakeven point.

Lockheed is in better shape with

How U.S. airlines stand on jet, turboprop orders

Airline	707	DC-8	Electra	880	Comet LV	Viscount	Britannia	Total	Dollar Amount*
American ...	30	..	35	..	..	..	..	65	$ 212.5
Braniff	5	..	9	..	..	..	..	14	52
Capital	..	..	..	..	14	75	..	89	135
Continental ..	4	..	..	..	..	15	..	19	38
Delta	..	8	..	10	..	..	..	18	87
Eastern	..	20	40	..	..	..	..	60	265**
National	..	6	23	..	..	..	..	29	86
Northeast ...	..	..	..	..	..	..	5	5	17
Pan American	23	25	..	..	..	..	..	48	295
Panagra	..	4#	..	..	..	..	..	4#	25#
TWA	33†	..	..	30	..	..	..	63	300
United	..	30	..	..	..	..	..	30	175
Western	..	..	9	..	..	..	..	9	19
TOTALS ...	95	89	116	40	14	90	5	449	$1,681.5

** Millions (estimated). ** Includes cost of 6 DC-8s optioned.*
 # Panagra aircraft and dollar value assumed in PAA order.
† Not yet formally announced.

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Utica technician viewing melt under a vacuum of approximately one-millionth of atmospheric pressure.

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the Electra with 133 firm orders. This figure normally would put a manufacturer over the top on development costs, and may already have for Lockheed. However, with the Electra's initial pricing aimed at sales in the order of 300 to 400, the Burbank firm still has some selling to do before the turboprop returns a good profit.

This appears to be no problem *if* both American and Eastern exercise their outstanding options for 65 planes. Such a move would raise Lockheed's backlog to about 200 valued at more than $400 million and could well attract other business.

But with all this selection in the large and medium turbine transport class, pickings still remain relatively lean in the short-haul or "DC-3 replacement" field.

Here, Fairchild has moved into the lead with 24 firm orders announced and 23 options by five local service airlines for its twin-turboprop F-27.

An expected contender for this market over the next 12 months, however, is Douglas with its proposal for a four-turboprop Model 1940 STOL transport. Although no firm decision has been made to build the 1940, volume orders this year will make it available by 1960, officials say.

Big question as to its acceptance no doubt will be initial price, reported to be about $1.2 million. Without some policy from the Civil Aeronautics Board that would strengthen their ability to finance new equipment, the feeder airlines hardly can afford to commit themselves for an aircraft such as the F-27 at half this price, much less the Douglas model.

And until this problem is solved, little can be expected in the way of a buying spree by local airlines of any turbine airplane or a serious competition among manufacturers to build one.

Manufacturers hold to schedule in jet and turboprop production

by Fred S. Hunter

THE "NEW LOOK" for the airlines—the jet look—is moving up fast. It's practically just around the corner, and the way things stand today, it looks as though it will arrive on time.

The factories all are on schedule, both in their engineering and production programs. If any hitches develop to upset the timetable they'll emanate from one of two sources: 1) subcontracted component deliveries; 2) delays in flight test programs.

Even where new facilities are required, like Douglas at Long Beach, the work is on schedule. Douglas already is at work on some subassemblies in the new subassembly hangar and the building contractor is scheduled to turn over the final assembly hangar on May 1. Dedication ceremonies for the new $20,000,000 assembly facility for the DC-8 will take place on May 10.

Pacing the field, of course, is Boeing, which got the jump on its competitors by its $16,000,000 venture in the 707 prototype on which it now has almost three years of flight experience. The first flight of the Boeing 707 prototype took place on July 15, 1954.

Roll-out of the first production Boeing 707 in the markings of Pan American World Airways is scheduled to take place in October this year, and all indications are the factory completion date will be met on schedule.

Only other manufacturer with a 1957 roll-out date is Lockheed, which will be right on Boeing's heels with December 1, 1957 as the date scheduled for the first turboprop Electra to come out of the final hangar to be turned over to flight test.

First Douglas DC-8 is scheduled to fly in March, 1958, and Convair's 880 is due to take to the air for the first time in January, 1959. Both of these airplanes have elongated flight test programs. Present schedule at Douglas is to flight-test the DC-8 the remainder of the year before starting flight tests for CAA type certification in February, 1959.

Douglas plans to use nine airplanes in the CAA flight-test program and to have 19 airplanes in the inventory by the CAA type certification date. Convair is scheduling two 880s for an eight-month company flight test program before beginning CAA tests.

With a background of flight experience with the 707 prototype, Boeing will be able to expedite its own flight-test program on its production models and is scheduling the start of CAA flight tests for February 1958, only three months after first flight. It will use seven planes in the flight program.

Lockheed also is setting up an expedited flight-test program on the Electra. It will make use of four resident aircraft in the flight-test program and will begin CAA flight tests on April 1, 1958. These four resident aircraft, incidentally, are in addition to the 133 Electras Lockheed has sold to customers and make the company's present production schedule a total of 137 planes. Lockheed plans to retain one of these resident airplanes after certification for continued tests, but the other three will be put up for sale.

Production schedule for new U.S. turbine transports

	Roll-out	First Flight	Start of CAA Flight Tests	CAA Type Certification	First Delivery
Boeing 707 ..	Oct., 1957	Dec., 1957	Feb., 1958	Dec., 1958	Dec., 1958
Convair 880 ..	Nov., 1958	Jan., 1959	Aug., 1959	May, 1960	Nov., 1959*
Douglas DC-8.	Feb., 1958	Mar., 1958	Feb., 1959	Sept., 1959	June, 1959*
Lockheed Electra	Dec., 1957	Jan., 1958	Apr., 1958	Aug., 1958	Sept., 1958

* Type for crew training.

Electra may be first

If it makes schedule, the Lockheed Electra will be the first of the new turbine-powered transports to get a CAA type certificate. The date Lockheed has projected is August 31, 1958. This is approximately three months ahead of Boeing's announced scheduled date of December, 1958 for the 707. There is, however, the possibility that Boeing may be able to advance this date and have a type certificate for the 707 even earlier than currently scheduled.

First Electra delivered by Lockheed will be the General Motors plane in June, 1958. It will be used by the Allison division for continuing engine flight tests and it undoubtedly also will make an efficient executive transport for the automotive corporation.

First airline to receive Electras will be Eastern, scheduled to get the first of 40 airplanes in September, 1958. Originally, American and Eastern were to have received simultaneous delivery of the two initial Electras, but American's schedule was changed by its changeover to the custom club interiors developed by its new design department headed by E. Gilbert Mason.

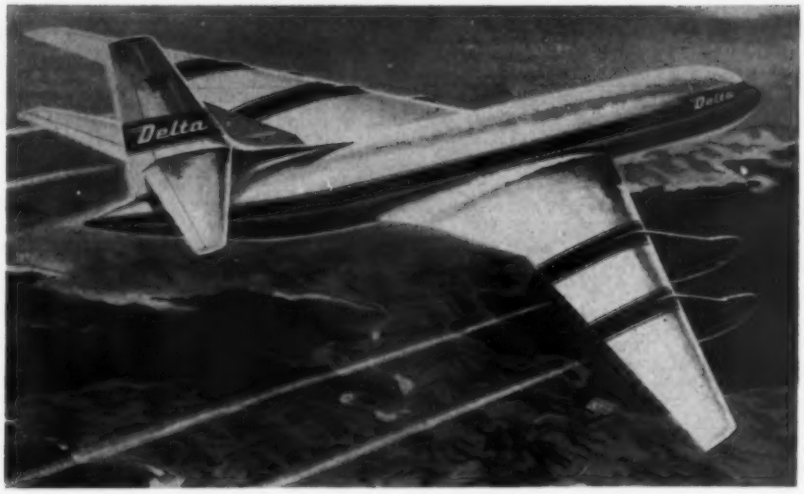
American now gets the first of its 35 Electras in January, 1959. Other first Electra deliveries are: first of 23 to National, April, 1959; first of nine to Braniff, May, 1959; first of nine to Western, June, 1959; first of 12 to KLM, September, 1959.

Next step in Boeing's flight-test program with the current 707 prototype will be to install one, possibly two, J75 engines in the airplane for flight evaluation. Boeing will continue to make use of the prototype airplane for some time.

Pan American has been talking to the manufacturer about taking it to Miami for advanced training of flight crews and other airlines have exhibited interest in buying flight time on the prototype for the same purpose. After this is done, there is a possibility the prototype may be fitted up as a cargo carrier and put into experimental service by The Flying Tiger Line, probably between Los Angeles and Detroit.

Top buyers of top turbines

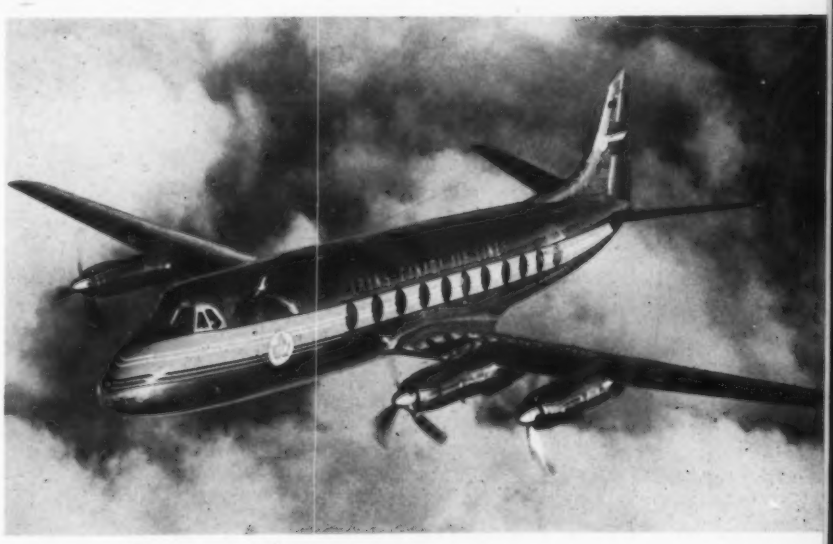
ALL JET OPERATOR will be Delta with order for 10 Convair 880s (right) and 8 DC-8s. TWA tops 880 buyers with order for 30.



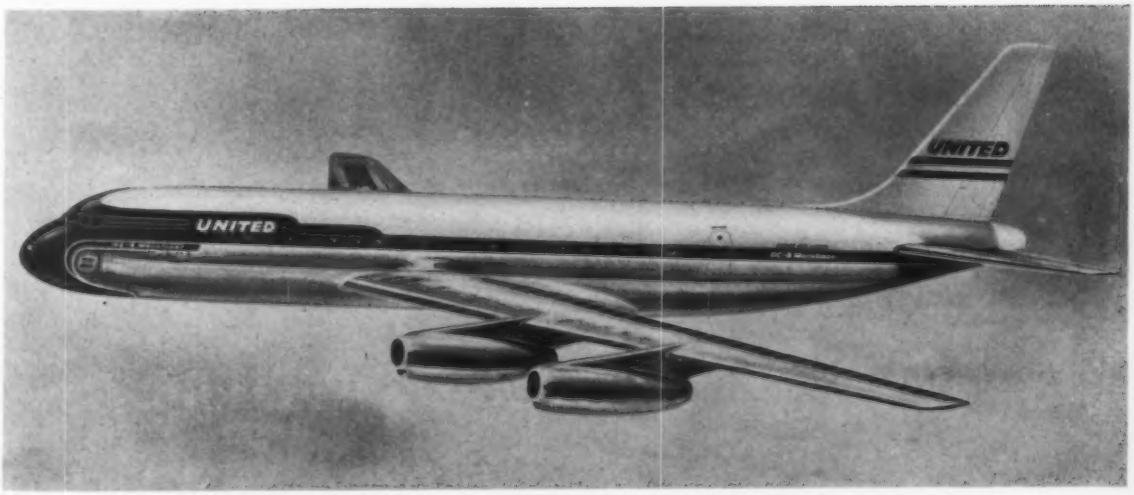
TOP BUYER OF Lockheed's Electra (below) is Eastern with firm order for 40, option for 35.

FIRST FOREIGN JET to land U.S. order is DeHavilland's Comet IV. Capital is buying 14.

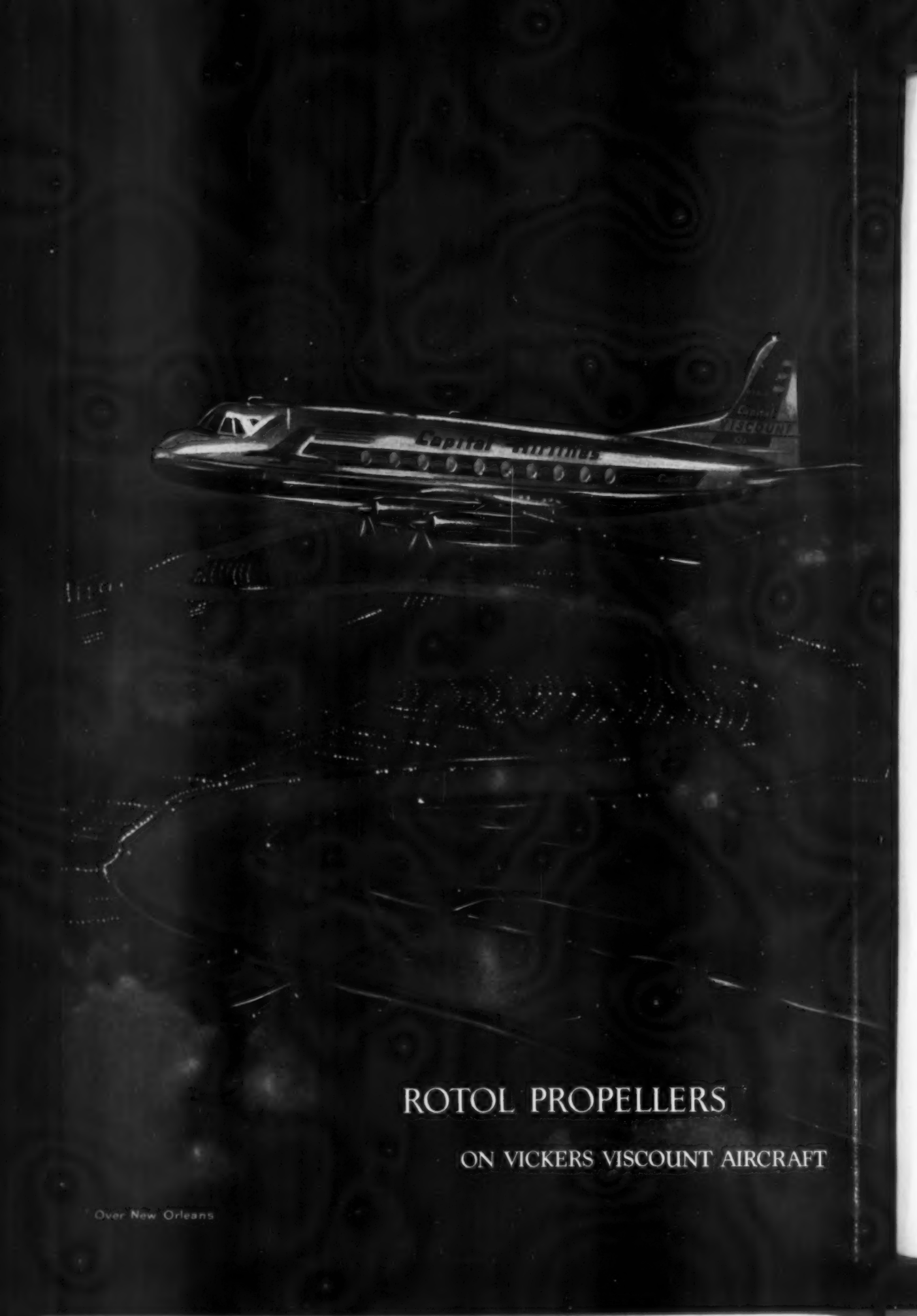
LARGEST TURBOPROP on U.S. airline scene is Bristol's Britannia (above). Northeast will get five.



FIRST NORTH AMERICAN airline to operate Vickers Viscount turboprop (right) was Trans-Canada Airlines. Top order, however, is held by Capital Airlines for 75.



BIGGEST BLOCK of Douglas DC-8s, No. 1 competitor for Boeing 707, goes to United, totals 30.



ROTOL PROPELLERS

ON VICKERS VISCOUNT AIRCRAFT

Over New Orleans

Airways are not ready for commercial jets

by Sam Saint

THE THRILL of my first long flight in the Boeing 707 is over. Even after sober reflection I remain convinced that this airplane of the future is a marvelous and wonderful machine. It appears fully ready to give commercial aviation its biggest step up since the Wright Brothers.

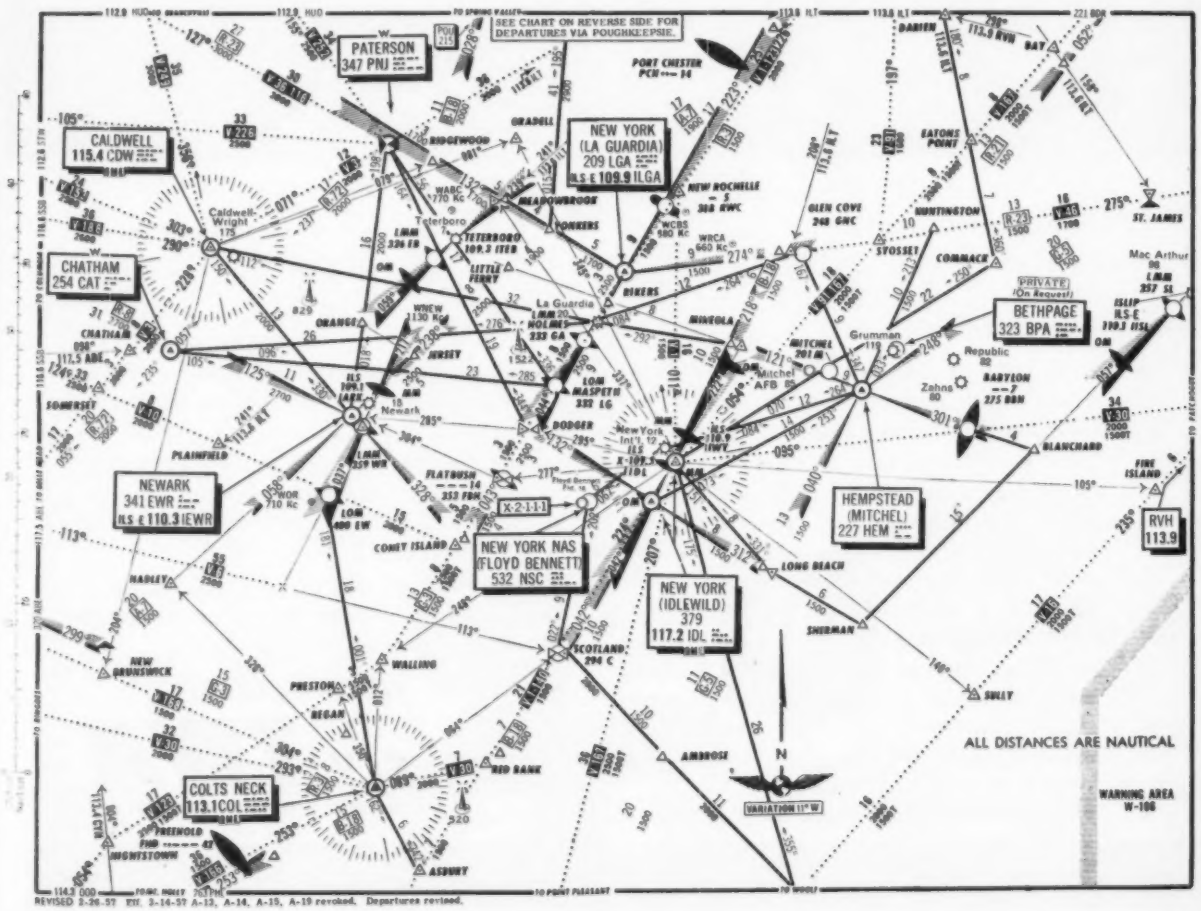
The machine itself, however, is only part of the problem. What of the highways on which these jets will operate? Navigational methods? Air traffic control? What operating problems will pilots and traffic controllers face? And how will these effect the return on the large number of invested dollars? Sober reflection on these things brings a rude shock. The environment this sleek monster is rushing into is not ready to receive it. Worse, there are large gaps in planning for a better environment.

The prospect of driving a giant jet airliner through the crowded air over our major cities can hardly be faced with equanimity. There will be times when the pilot of a Boeing 707 or a Douglas DC-8, climbing westward out of Idlewild, over the Jersey marshes, hurtling upward through cloud at 300 knots, with traffic on all sides, will find himself suddenly unconnected from the air traffic control system—unable to talk to the controller because of the babble of too many talking at once on a jammed communications circuit. The 130 or more passengers in the back will know nothing of this. But the pilot will know; and so will the controller, who may see radar targets converging and be unable to get a word of warning through the cluttered air.

If you think this is the exaggerated talk of an alarmist, ask the next airline pilot you meet. He'll tell you this is already happening at today's speeds. He'll tell you that what has been a tolerable level of confusion is steadily turning into an intolerable level of hazard.

A careful analysis of problems jet operators will face provides cause for deep concern. Not because the jet creates new problems—it doesn't—but because it will sharply increase old problems.

It is not reasonable to expect the present, completely manual air traffic control system to keep up with the increasing volume and speed of traffic



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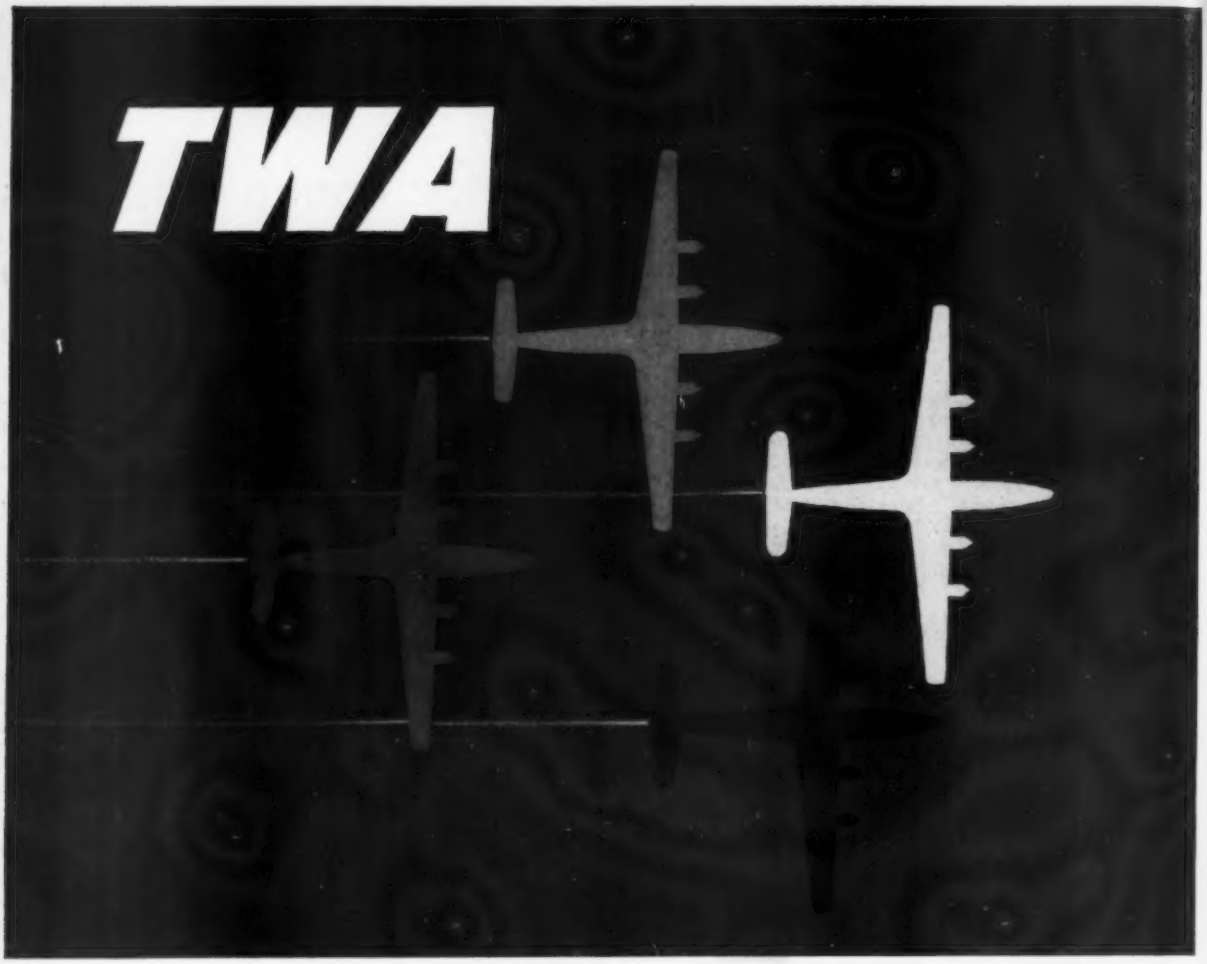

1956...
A YEAR OF GROWTH FOR TWA

During the past year, TWA has experienced steady growth. Every phase of America's largest domestic—international airline has been expanded and improved.

New routes across the world. In this country, service was inaugurated to Denver, Tulsa and Oklahoma City. CAB approval forecasts additional service for Boston and Hartford . . . and extension of international routes from Ceylon to the Philippines.

Passenger mileage soared. TWA's domestic routes accounted for 3,266,510,000 passenger miles . . . up 13.6% over 1955. And for international . . . 710,895,000 . . . a 13.2% increase.

A giant new $25,000,000 overhaul base began operation at Kansas City. First to use new dynamometers for engine test!

Now . . . in 1957 . . . TWA's magnificent new JETSTREAM*! Offering the quietest, most luxurious, longest-range service in the world . . . beginning July 1st.

As in the past, TWA keeps forging ahead. Striving always to bring the best to American air travel . . . in every possible way.

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weaving in and out of the multiple airports of our biggest terminal areas. Controllers will throw up their hands at scopes with too many targets. (There are frequently more than 150 targets within the 50-mile range circle of the New York area radar.)

Pilots and controllers alike will get lost in the maze of switching back and forth among the 42 old-fashioned, party-line radio telephone circuits already in use in the New York area. The more than 70 controllers and assistants on a single shift in the New York Control Center will bog down under the tremendous task of passing and recording control data by word of mouth and pencil written notations. At double today's speeds, the airplane will get ahead of its data. Too often the pilot of the jet will find himself talking to controllers *who didn't know he was coming.*

Pilots, already asked to perform near miraculous feats of navigation on the tricky and complex routings used in areas of high traffic density, will be asked to run these obstacle courses at twice the speeds of the past. The pilot of a 707 westbound out of Idlewild will fly at least four different courses, tune eleven navigation and communications frequencies and make from four to 10 radio contacts in the first five minutes after his wheels leave the ground.

Mistakes are certain

Adjust your bifocals, Dad, and look at the chart the pilot must use to do this (page 71). Visualize trying to read this on your lap in rough air at night between the lightning flashes.

He will have to read this chart because ATC, likely as not, will have changed the outbound routing while he was running up his engines for take-off. *Pilots, like controllers, will make mistakes. This can be predicted with certainty.*

This is not the popular version of what's-in-store-for-the-jets-of-tomorrow. If you want the popular version, listen to the speeches of top men in government and industry, or scan the carefully worded publicity releases, or tune in on budget hearings before congressional committees. You'll be lulled into a satisfied stupor. The opiate in the pill: RADAR. Buy us more radar, Mr. Congressman, and our problem will be solved.

The too-quick conclusion that radar and more radar is the answer to air traffic ills is not surprising. It is dramatically true that radar has doubled the capacity of the air traffic control system—and at a time when our backs were against the wall. Sure we need radar. We need to spread its use and make what technical improvements we can. No disagreement there. But what of the future? Will manual radar control as we know it today stand up under the increasing pressures of the jet age?

The famous, Collier-award winning Special Committee-31 of the Radio Technical Commission for Aeronautics gave long and careful consideration to the will-of-the-wisp prospect of a radar world in which traffic would always flow smoothly. The SC-31 conclusion of 1948, equally valid today: Voice direction of traffic by watching radar "pips" will not stand up under increasing traffic pressure.

SC-31 considered all the frills we talk of today: radar beacons to add identity to the pips on the scope and to keep them from disappearing in rain clutter. And let's divide the picture into wedges and altitude slices to keep workload within bounds. One contingent favored televising the radar picture to the cockpit so the pilot could help control himself. The conclusion remained the same: This kind of control would break down under pressure.

In the oversimplified analysis on which present policy is based SC-31 would appear to have been wrong. For example, when long range radar was put to work untangling the snarls of the New York area, overloaded communications circuits quieted down and sanity returned to the air over Allentown, Pa.

No one can deny that radar has been the biggest boon in air traffic control history. The glowing spots of phosphor on radar scopes have given us a honeymoon period in air traffic control. But a closer look will show that the honeymoon is already threaten-

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BEA is largest airline operating within Europe.
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BEA pleases all passengers with its friendly service . . . consistently
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ing to come to a disillusioning end.

Consider what happens to *any* control system when traffic volume approaches the capacity of the system. With traffic volume comfortably below the capacity of the system, airplanes or automobiles or parts on a production line flow smoothily. Communication requirements are low. Little planning or organization is needed to keep whatever moving to wherever. But as volume builds to approach the capacity of the system the picture changes rapidly.

Pilots must navigate more accurately, controllers must plan farther ahead and must get more frequent position reports from increasingly harassed pilots. The load on communications circuits suddenly begins to skyrocket out of all proportion to the actual increase in traffic.

Stacking traffic

If, on top of this, the smooth flow of traffic is momentarily interrupted at a bottleneck point, a chain reaction of new complications often pushes control workload hopelessly off scale. Holding stacks fill up quickly. The ATC Center sends out flow restriction messages *and traffic slows to a level far below the flow of a few minutes before.* Pilots and dispatchers who planned on no delay are suddenly faced with 40-minute holds, or maybe as much as an hour.

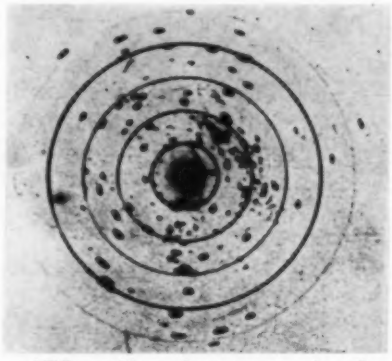
In the pre-radar days of ATC this was a common occurrence. Now we have a breather. Radar has allowed airplanes closer together with safety. Again we have excess capacity in the airways system. Radar, the magic miracle of the moment, has reduced the number of position reports needed, cut the amount of advance planning required and reduced communications congestion to the frantic-but-livable range.

So everyone leaps to the conclusion that we have found the answer to future traffic tangles. Have you a problem? You buy a radar.

It seems simple, but pilots and dispatchers, and eventually the Board of Directors, will learn the hard way that it isn't quite that easy. They will learn that radar control is even more susceptible to complete collapse under peak loads.

Your reporter was privileged to study what happens to radar control when the heat is poured on during eight weeks of experiments aboard an aircraft carrier at sea. At traffic loads *approximating present volume at Washington or Chicago* complication would begin to peak sharply. Even small increases in traffic volume would double and quadruple the number of times controllers talked to each pilot. Long before the theoretical capacity of the system was reached things would start coming apart at the seams.

With one too many airplanes the operation would suddenly come down around the controller's ears like a house of cards.



ATC problem—how many planes?

A radar controller controls traffic as it moves. He must keep up with the workload of the moment—or fall back on the same old pencil written "strip postings" of the past. Take a look at a strip posting—reproduced here in actual size just as it was taken down from the control board. When radar control bogs down, this is the sort of bookkeeping system that will keep track of your $4-million investment as it bores through the ozone at 600 miles an hour.

It doesn't make sense in this age of electronic marvels.

The future for jet operations can be predicted with near certainty: An increasing number of "hairy" control breakdowns, pilot protests and rising public clamor, all resulting, inevitably, in the application of FLOW CONTROL to preserve a degree of safety. At this point, the airlines and other operators, whose big kerosene burners are losing money waiting their "turn" in the system, will at long last take a close look at the sorry picture of ATC development.

Answers too late

Much too late they'll wonder why several hundred millions have been spent in the technical battle between Tacan and VOR/DME, while nothing effective has been done about the practical problem of giving the pilot a simple, navigational "picture" so he can "thread the needle" at high speed safely. They'll discover that a half dozen good ways of putting routine control messages into the cockpit with visual signals have lain dormant for years—because you can't tie an automatic data link to pencil scratches on paper.

And they'll find that machines have not been provided to help the man on the ground because pilots and controllers and dispatchers have not been sent by their bosses to provide the necessary operational guidance for development.

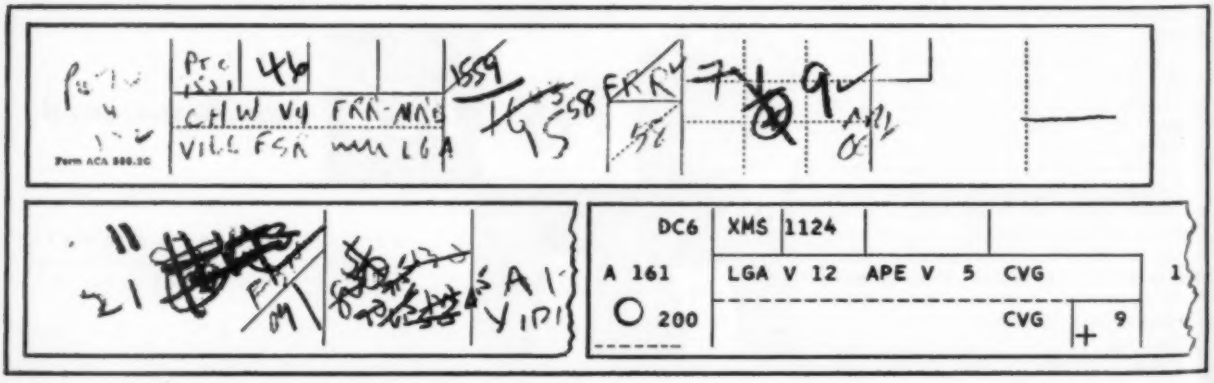
When they have taken a careful look, airline operators will discover that there are practical ways to improve ATC that are not yet being exploited. And they will work their slide rules to find that potential savings by improved control are tremendous.

For example, if the jet fleet now on order by U.S. airlines were to save an average of 10 minutes on each 1,500-mile flight, the reduction in direct operating costs would be about $45 million per year. Considering the turboprop aircraft and the conventional piston types that would benefit also, the savings might jump to $150 million per year.

Increased safety would provide a bonus over and above that.

In the end airline operators are likely to wonder why they paid so little heed to this important matter for so long.

TODAY'S TOOLS for ATC. Strip posting (top) is actual size used by controller. Strip at lower left shows "laddering down" process. At right, IBM flight plan strip.



11 famous airlines* have chosen the superb Boeing 707–to fly you in unbelievable comfort and quiet at 600 miles an hour.

The 707–America's first jet airliner is the brilliant new expression of Boeing's unmatched experience in jet aviation.

BOEING 707

Airline accident record for '56 better than '55

by William O'Donnell

U. S. SCHEDULED AIRLINES in 1956 met and overcame the biggest challenge yet faced in prolonging a safety record that got its start in 1952.

Despite the loss of 117 passengers and 11 crew members in the June 30 collision of a Trans World Airlines Constellation and United Air Lines Douglas DC-7 over Grand Canyon, domestic and international operators completed the year with a fatality rate below one per 100 million passenger-miles for the fifth successive year.

Four accidents accounted for a total of 156 passenger and crew fatalities, two below the toll for 1955. Domestic carriers, which accounted for all of the fatal accidents during the year, operated 10 of the 12 months with an accident-free slate.

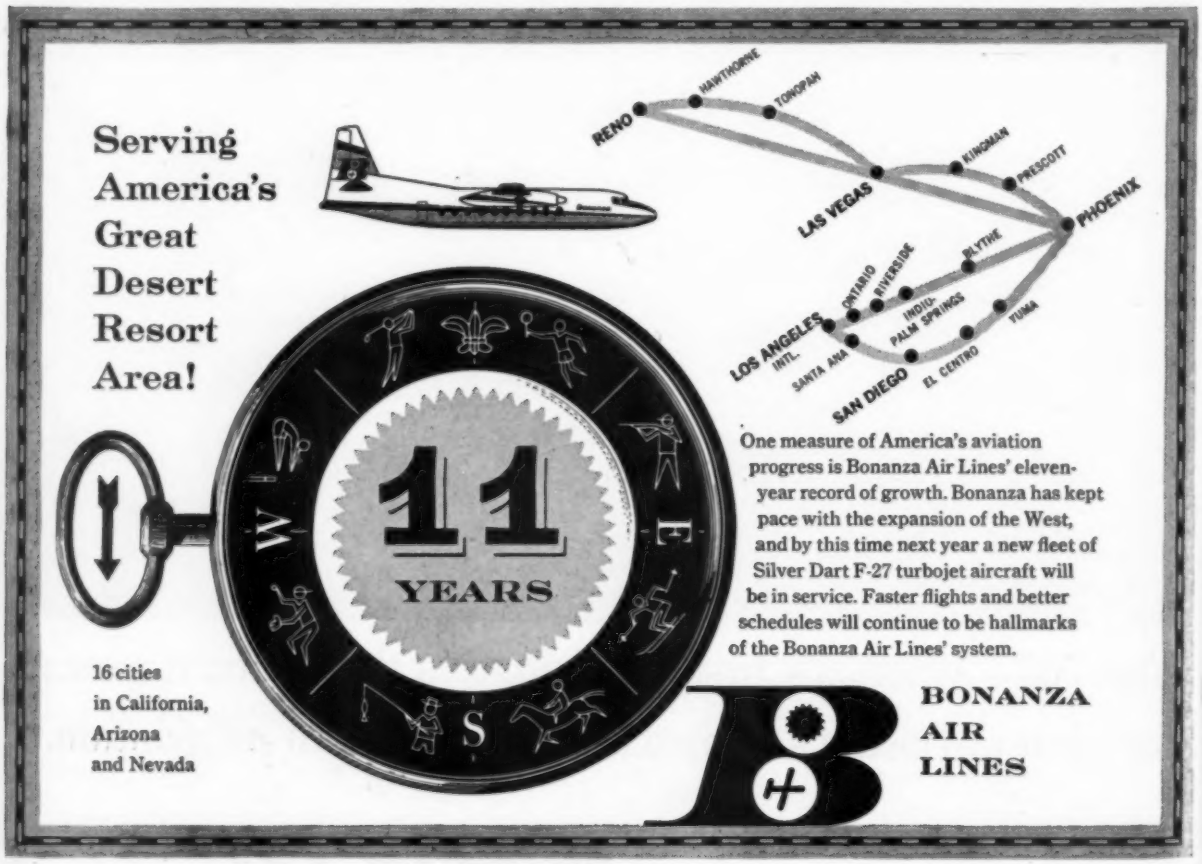
Final fatality rate for these carriers was 0.64 compared to 0.79 in 1955.

In international operations, except for territorial services, foreign and overseas airlines extended their safety record at the year-end to 21 months without a passenger fatality.

Compared to 1955's rate of 0.04

U.S. Scheduled Airlines' 10-Year Safety Record

Year	Number of Fatal Accidents	Fatalities Passenger/Crew	Passenger-Miles Flown Per Psgr. Fatality (000)	Plane-Miles Flown Per Fatal Accident	Fatality Rate Per 100M Passenger Miles
			Domestic		
1956	4	143/13	162,118	167,325	0.6
1955	7	156/21	131,736	86,654	0.8
1954	4	16/7	1,086,863	134,087	0.1
1953	4	86/15	178,346	126,268	0.6
1952	5	48/6	282,536	89,432	0.4
1951	8	142/24	77,111	49,199	1.3
1950	4	96/13	87,118	87,344	1.1
1949	4	93/11	76,032	83,426	1.3
1948	5	83/15	75,249	64,166	1.3
1947	5	199/17	31,693	62,628	3.2
			International		
1956	0	0/0	5,448,000	142,000	0.0
1955	1	2/2	2,300,011	124,068	0.04
1954	0	0/0	3,904,459	111,597	0.0
1953	2	2/0	1,782,710	52,334	0.056
1952	3	94/9	33,795	33,032	3.0
1951	1	31/9	88,223	93,412	1.1
1950	2	48/8	48,713	45,270	2.1
1949	0	0/0	2,168,780	99,038	0.0
1948	1	20/10	98,089	93,919	1.0
1947	3	20/13	93,152	27,708	1.1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One measure of America's aviation progress is Bonanza Air Lines' eleven-year record of growth. Bonanza has kept pace with the expansion of the West, and by this time next year a new fleet of Silver Dart F-27 turbojet aircraft will be in service. Faster flights and better schedules will continue to be hallmarks of the Bonanza Air Lines' system.
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Braniff's El Dorado: Braniff's fabulous version of the DC-7C, world's fastest, finest airliner. Now serving New York, Washington, Dallas, Houston, San Antonio and Chicago, El Dorado service will be extended to Braniff's South American routes on May 15, 1957.

Lockheed Electra: Newest turbo-prop aircraft. Cruising speed 410 mph. Nine of them will join the Braniff fleet in 1959.

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Here are the pictures that tell the story of Braniff's "warm-up" for the future—with NEW equipment, NEW facilities and NEW services.

Today, Braniff flies 16,422 route miles, serving more than 60 cities in the USA and Latin America. 4,612 Braniff employees share the job of providing friendly service and on-time dependability that is famous throughout the hemisphere.

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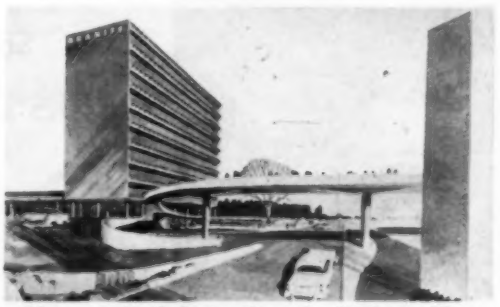
NEW ROUTES: BOGOTÁ, Colombia, has been added to Braniff-served South American cities. Direct through service between New York, Washington, Miami, Panama and Bogotá is scheduled to start soon. Three 4-engine DC-6 flights weekly, with first-class and tourist accommodations on all flights. The ONLY through service between Washington and Bogotá!

Boeing 707: 1960 will see Braniff flying this turbo-jet; the ultimate in swift, luxury air travel. Cruising speeds up to 600 mph. 109 to 136 passengers.



New administration building: Now being built just a few minutes from the new Dallas terminal and Braniff's new operations and maintenance base. Scheduled for occupancy in a few months.

New operations and maintenance base: Braniff's new home base at Love Field, Dallas, will be ready for service in early 1958. It will house all operation, maintenance and hangar facilities.

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fatalities per 100 million passenger-miles, international lines achieved the remarkably low figure of 0.09 in 1956.

The overall industry rate was 0.53 fatalities per 100 million passenger-miles, compared to 0.65 in 1955.

According to estimates issued by Civil Aeronautics Board 28,631 million passenger-miles were flown by scheduled domestic and international carriers during 1956. Plane-miles were estimated at 811.3 million.

In addition to fatalities included in scheduled U.S. airline operations, three Alaskan carriers suffered accidents in which three crewmen and 10 passengers died. Two crewmen were killed in accidents involving other revenue operations and non-scheduled charter flights, in Alaska.

Human factors blamed

The CAB estimates indicate that there were 49 accidents among the scheduled domestic lines compared to 40 in 1955. Plane miles flown per accident in 1956 was down to 13,659,183 from the 1955 figure of 15,164,600.

Three of the four fatal accidents during the year were probably caused by human factors, according to CAB findings.

In the April 1 crash of a Trans World Airlines 4-0-4 near Pittsburgh, Pa., the probable cause was cited as "uncoordinated emergency action in the very short time available to the crew, which produced an airplane configura-

The 1956 fatal accident record

Date	Location	Airline	Aircraft	Fatalities: Passenger	Fatalities: Crew	Probable cause
Domestic Scheduled						
4/1	Pittsburgh	TWA	Martin 4-0-4	21	1	Uncoordinated emergency action in the very short time available to crew.
4/2	Seattle	NW	Boeing 377	4	1	Incorrect analysis of control difficulty under conditions of great urgency within extremely short time available for decision.
6/13	Shelby, N. C.	Piedmont	DC-3	1	0	Accidental opening of main cabin door by passenger.
6/30	Grand Canyon	UAL TWA	DC-7 L-1049	54 63	5 6	Collision (no CAB report issued yet).
Alaskan Carriers						
4/9	Skilak Lake, Alaska	Cordova Airlines	Aero Commander	5	1	Crashed into slope.
8/19	Lake Diana, Alaska	Alaska Coastal	Piper Pacer	1	1	
10/2	Nome, Alaska	Alaska Airlines	Stinson AT-19	4	1	
Other Revenue						
7/2	Nome, Alaska	Muns Airways	DeHavilland Dove	0	1	Hit peak.
Non-Scheduled Charter						
12/16	Tin City, Alaska	Alaskan Airlines	Stinson Gull Wing	0	1	

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• The Northliner fleet is the largest among local airlines — now 26 Douglas DC-3's. Since the start of operations North Central has flown over 33,000,000 plane-miles — and with a perfect safety record.

• Every 90 seconds a North Central plane is landing or taking off somewhere on the system. Northliner pilots execute 700 take-offs and landings in the course of a day's operations.

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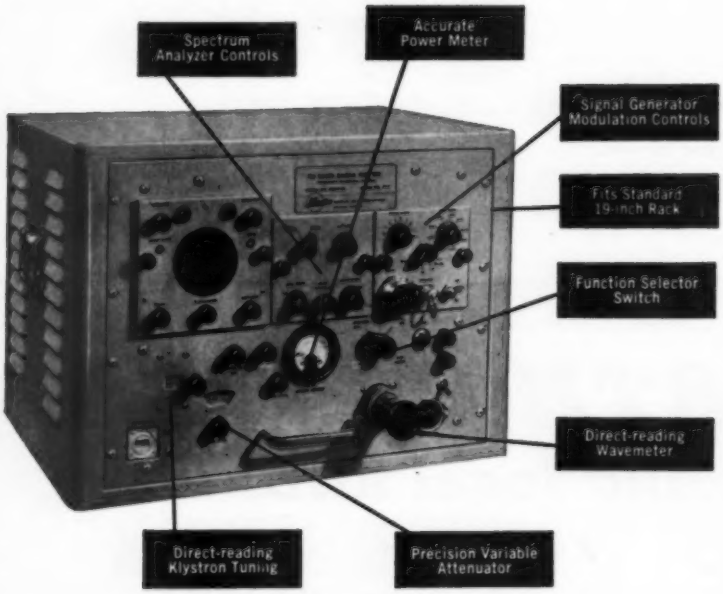

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tion with unsurmountable drag."

The April 2 ditching of a Northwest Airlines Stratocruiser was reported probably due to incorrect analysis of control difficulty. CAB noted that the analysis which led to the ditching of the aircraft in Puget Sound was made under conditions of "great urgency and within an extremely short period of time available for decision."

The Pittsburgh crash occurred within a minute after takeoff and the Puget Sound ditching about four minutes after takeoff.

CAB said the probable cause of the June 13 accident in which a passenger fell from a Piedmont Aviation DC-3 over Mount Shelby, N. C. was the accidental opening of the main cabin door in flight by the passenger.

Other airline services and safety records:

U. S. helicopter services carried 64,000 passengers 1,592,000 passenger miles without a fatality. The end of the year completed 42 consecutive months without a fatality in a passenger helicopter. This is as long as the helicopters have been carrying passengers.

Military Air Transport Service aircraft logged 1,190,000 hours during 1956, an increase of some 20,000 hours over 1955. Transport operations accounted for half this total.

Accidents were reduced by 18% over 1955 for an all-time low of approximately five accidents for every 100,000 flying hours.

Certificated cargo and nonscheduled operations had no fatal accidents during 1956.

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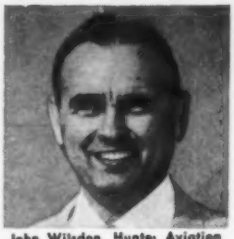
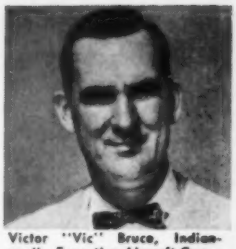
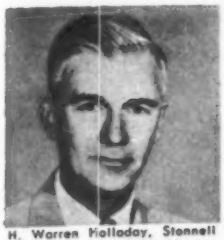
Peter Graves, Southern Ohio Aviation Sales Co., Dayton Municipal Airport, Vandalia, Ohio.



John Wilsdon Hunter Aviation Co. P O. Box 122 Lambert Field, St Louis, Missouri



Victor "Vic" Bruce, Indianapolis Executive Aircraft Corp., Indianapolis Municipal Airport, Indianapolis, Indiana.



H. Warren Halladay, Stennell and Halladay, 843 Washington Building, Arlington Towers, Arlington, Virginia.

A. M. "Sime" Bertolet, Reading Aviation Service, Inc., Municipal Airport, Reading, Pennsylvania.

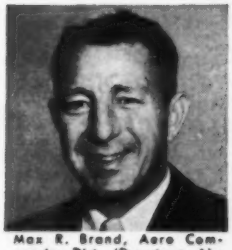
H. Leibee Wheeler, Buffalo Aeronautical Corporation, Buffalo Municipal Airport, Buffalo, New York.

John S. Brown, Brown Aero Corp., 3300 Love Field Drive, Dallas, Texas.

Robert F. Wood, Newport Air Park, Newport, Rhode Island.

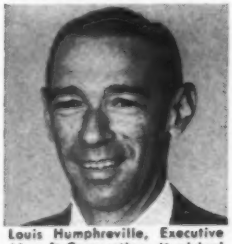
Wynn Cronje, Minnesota Airmotive, Inc., Minneapolis-St. Paul International Airport, Minneapolis, Minnesota.

Norman Hoffman, West Texas Flying Service, Midland Airport, Box 82, Midland, Texas.

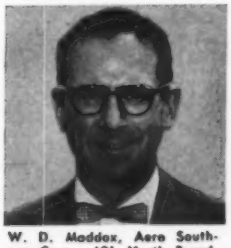


Max R. Brand, Aero Commander Dist. (Downtown Airpark), Hangar 3, Municipal Airport, Tulsa, Oklahoma.

E. H. "Ted" Talan, National Aero Sales Corp., Midway Airport, Chicago, Illinois.



Louis Humphreville, Executive Aircraft Corporation, Municipal Airport, Pontiac, Michigan.



W. D. Maddox, Aero Southern Corp., 601 North Broadway, Nashville, Tennessee.

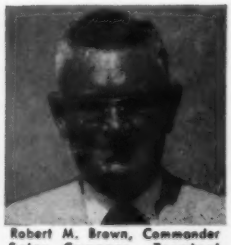
O. B. Callan, Fairfax Aviation, Inc., 3301 Fairfax Trafficway, Fairfax Airport, Kansas City, Kansas.

John A. "Jack" Bauman, Santa Monica Aviation, 3011 Airport Avenue, Municipal Airport, Santa Monica, California.

Herrol Bellamy, L. B. Smith Aircraft Corp., Miami International Airport, Miami, Florida.

Lucien M. Taillac, Trans-Aire Corporation, Pan-Air Building, New Orleans Airport, New Orleans, Louisiana.

Jack Gregg, Northern Aircraft Co., International Terminal Building, International Airport, Oakland, California.



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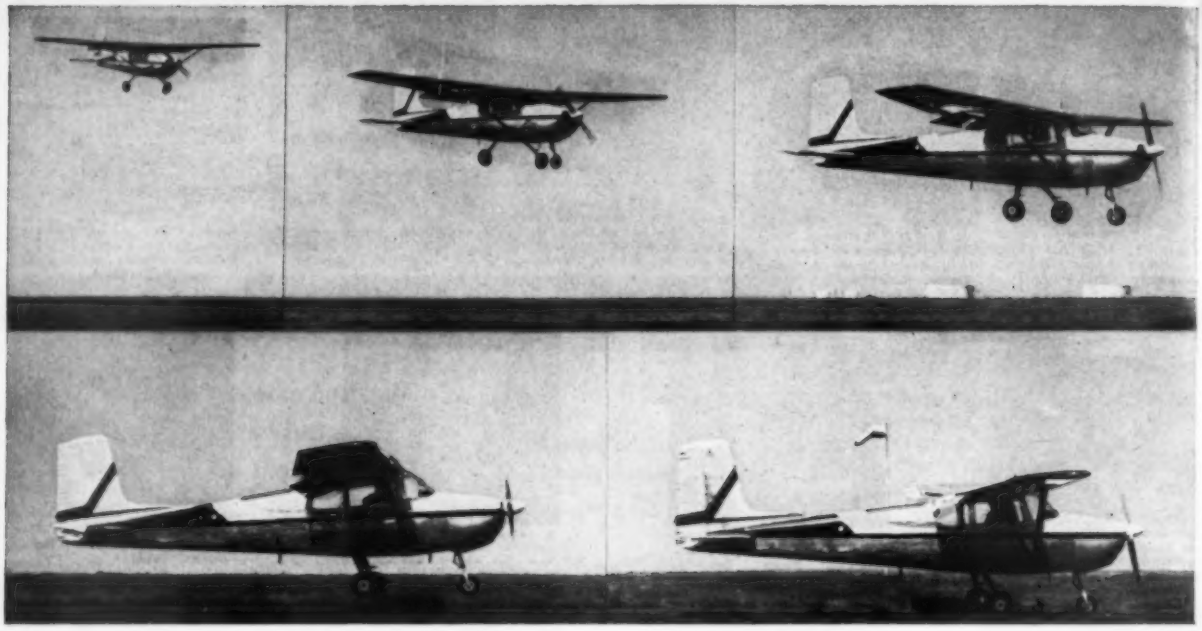

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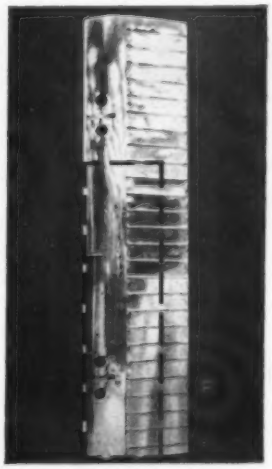

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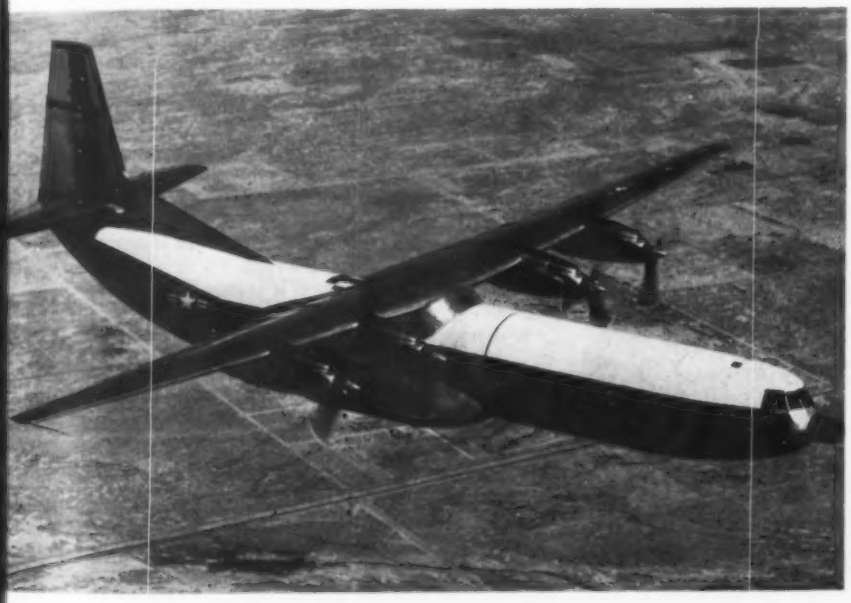
MATS faces drastic changes in organization

by Henry T. Simmons

LIKE MOST OTHER U.S. carriers, the Military Air Transport Service of the Air Force is riding the crest of an expanding volume of traffic.

MATS' diverse fleet of four-engine transports plied 115,000 miles of global air routes last year, racking up record movements of personnel and cargo. The organization averaged an Atlantic or Pacific transport crossing every 23 minutes, and at the same time lopped its accident rate to an all-time low of five accidents per 100,000 flying hours.



Yet the future is far from rosy for the world's largest (45,000 personnel) airline. Two principal problems are dogging MATS: Sweeping administrative and organizational changes brought on by a Pentagon directive signed by Defense Secretary Charles Wilson last December, and a sudden increase in political activity by commercial air carriers bent on securing a greater portion of MATS business.

The focus of the political efforts of the commercial carriers and other groups is the House Appropriations Subcommittee on the Defense Department, headed by Rep. George Mahon (D-Tex.). Several groups have already appeared before Mahon's subcommittee to argue for a curtailment of MATS' operations and a corresponding increase in use of commercial air carriers.

Those testifying on the MATS portion of the military budget include Stuart Tipton, president of the Air Transport Association, Ralph S. Cox, Jr., president of the Aircoach Transport Association, Francis J. Roach, general manager of the Independent Military Air Transport Association, and a representative from the U.S. Chamber of Commerce.

The upsurge of commercial carrier interest in MATS this year is a far cry from last year's performance, when the only witness who spoke out in favor of a reduction in MATS' volume was Perry Shoemaker, president of the Delaware, Lackawanna & Western Railroad Co. and former member of the Transportation Committee of the Hoover Commission.

The lawmakers, spearheaded by Reps. Daniel Flood (D-Pa.) and Jamie Whitten (D-Miss.), subjected MATS to the most searching scrutiny of its history in last year's budget hearings. They gathered 194 pages of testimony in the process, and indications are that they may do as well or better in the current appropriation hearings, which have not yet been released at the time of this writing.

Commercial airlines worried

What bothers the commercial air carriers is the steady growth in MATS volume since 1949. In that year, the government airline racked up 478 million passenger/patient miles and 129 million ton-miles for all people and freight (see chart). Last year, it piled up 2.8 billion passenger/patient miles and 803 million ton-miles for all people and freight—a sixfold increase in both categories.

The commercial carriers, of course, would like to get a bigger share of this government business. They argue that MATS, as a government agency, is competing with private industry in an area in which it can efficiently serve the government. They support their position by citing the Administration's oft-stated policy of eliminating all nonessential commercial activity conducted by the federal government.

Most parties would agree, however, that the question of what is "nonessential" MATS activity is a tough one to answer. That's because MATS' primary mission is to maintain a military transport establishment of sufficient

MATS traffic flow since founding

Category	June-Dec., 1948	1949	1950	1951	1952	1953	1954	1955	1956
Passengers/Patients Carried	.....	.....	.....	1,138,000*	557,743	527,631	550,116	735,662	848,099
Passenger/Patient Miles	479,352,039	478,042,528	703,913,646	889,810,132	1,097,868,195	1,210,561,973	1,705,634,035	2,471,835,810	2,848,013,115
Cargo & Mail (Tons)	.....	.....	.....	199,000*	86,462	85,531	95,235	139,231	167,178
Passenger/Patient Cargo/Mail (Ton-Miles)	133,901,016	128,529,786	173,708,096	264,075,386	285,720,418	325,044,179	510,187,635	732,297,390	803,171,390

* *Cumulative from June 1, 1948*

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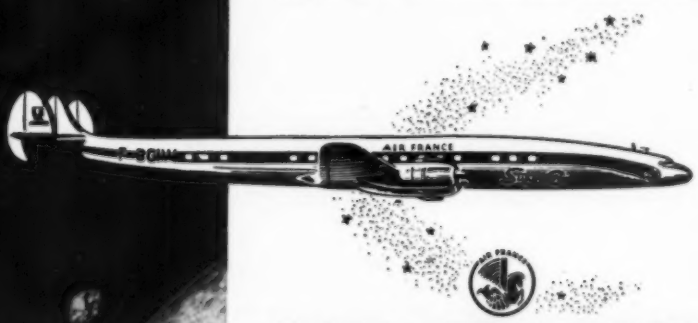

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strength to meet the approved wartime requirements of the military services as established by the Joint Chiefs of Staff. What's more, this airlift force must be ready at all times, and it must be completely responsive to military command.

Once MATS' basic mission is understood, the persistent expansion of its operations during the past seven years becomes more comprehensible. The fact is that MATS is not a colossal boondoggle at the taxpayers' expense, but a military organization designed to meet military requirements without the finicky attention to cost which commercial airlines must necessarily give their operations.

Not only has the military requirements for wartime airlift capacity climbed steadily since the Korean War, but actual peacetime use of MATS' facilities for the shipment of personnel and high-value cargo has risen steadily because of the great savings which rapid air transport can assure in these areas.

The commercial charter operators have shared in the general increase in MATS volume, although not to the extent they experienced during the Korean War when the organization contracted for an enormous amount of commercial lift. In 1955, commercial augmentation of MATS amounted to approximately $5.6 million, and private operators carried 14.6% of all personnel and 2.7% of the cargo.

It is understood that commercial augmentation for 1956, including such activities as the dramatic airlift of Hungarian refugees, underwent an eightfold expansion to approximately $43 million in volume. Personnel movements by charter operators in 1956 climbed to more than 20% of the total, while their share of the cargo lift amounted to more than 10% of the total.

That single-manager concept

Whatever the outcome of the commercial carriers' efforts to pick up an increased volume of military traffic through new restrictions on the scope of MATS' operations, it appears likely that the present trend toward bigger commercial participation in MATS' movements will continue.

Political troubles are only a part of MATS' current difficulties. The other part, and perhaps the most important, stems from Defense Directive No. 5160.2, issued Dec. 7, 1956.

This document, among other things, establishes a "single manager" form of organization for MATS, provides for MATS' absorption of the Navy's Fleet Logistics Air Wings as well as certain USAF troop carrier wings, and directs MATS to place its transport activities under an "industrial fund" accounting system in fiscal 1958, beginning July 1.

The single manager concept is a simple idea as far as MATS is concerned. The Secretary of the Air Force has been designated a single manager for all military airlift, with Lt. Gen. Joseph Smith, MATS commander, serving as his "vice president for operation." What complicates the picture is the fact that both the Army and Navy have been given single-manager assignments of their own for other types of transportation and these threaten to cut across the Air Force responsibility in certain areas.

"One of the objectives of the single-manager concept is to integrate MATS, FLOGWINGS, LOGAIR of the USAF Air Materiel Command and the Navy's QUICKTRANS," explains a Pentagon official. (The two latter operations are air cargo movements within the U.S. which are provided by civilian contract carriers for the Air Force and Navy.)

"Our feeling is that by integrating these into one ball of wax we really get a flexible force which is able to meet the priority needs of the country without all the fuss which would occur if they remained separate entities," he continues. "In fact, I think the Berlin airlift would have worked even better than it did had it been a single, truly integrated airlift." (See 1948 entry in statistical chart for impact of Berlin airlift on MATS.)

It does not appear likely that MATS will ever absorb the domestic air cargo operations of the Air Force and Navy since its responsibility is mainly for overseas airlift. Conceivably LOGAIR may be expanded to provide

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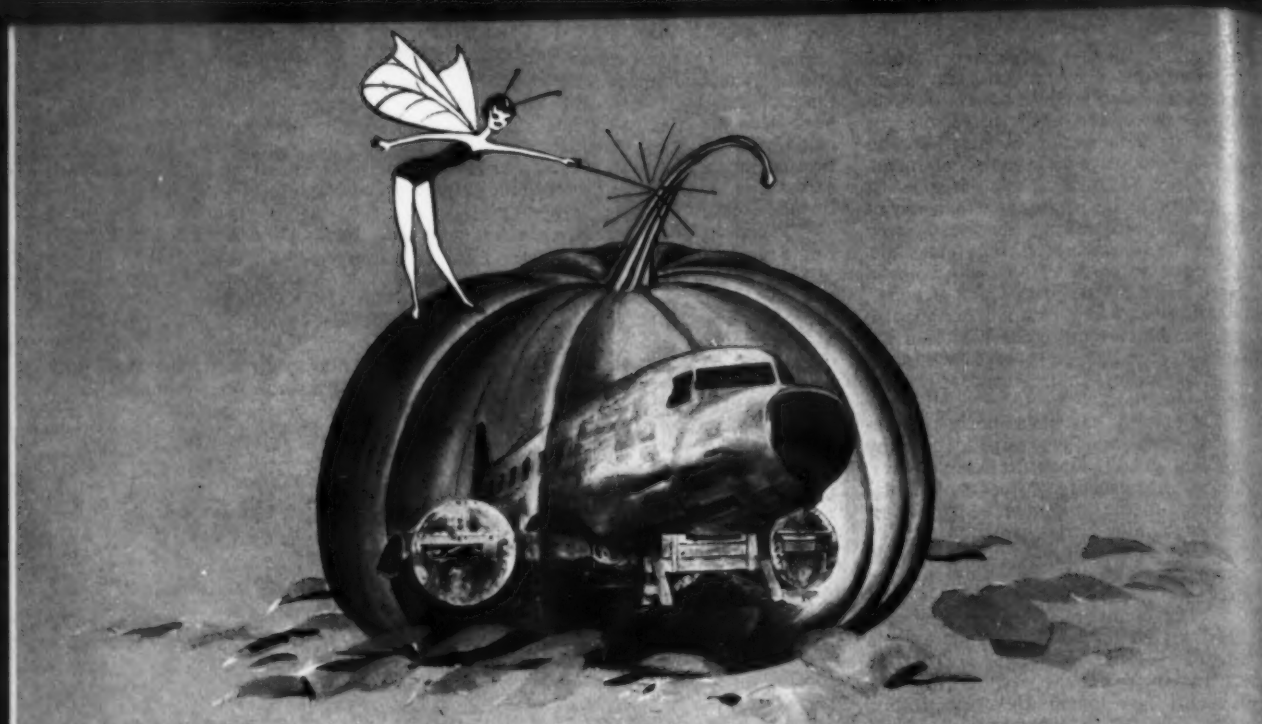

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AIRLINES have long relied on PAC's services for engine overhaul. Currently, 11 air carriers contract with PAC for this important service—including the Flying Tiger Line and Slick Airways, who look to PAC for overhaul of the R2800-CB engines powering their fleets of DC-6s.

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AGAIN THIS YEAR PAC will conduct Pratt & Whitney Aircraft Engine Operation and Maintenance Forums. Dates now scheduled are: Denver, May 14; Burbank, May 17; Oakland, May 20; Seattle, May 22. Those desiring to attend are invited to write PAC for reservations and tie-down arrangements.

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all domestic airlift required by the Army and Navy as well as the Air Force, but this decision is complicated by the fact that the Military Traffic Management Agency of the Army controls all stateside commercial transportation for the military services under a separate single manager directive of its own (see story, p. 93).

Absorption of FLOGWINGS

The long-heralded absorption of FLOGWINGS by MATS has turned out to be something of a disappointment to MATS. After the dust had cleared away from the December directive, it developed that the Navy would keep all of the twin-engine aircraft assigned to FLOGWINGS, plus 30 of the four-engine transports—10 each for the Atlantic and Pacific fleets, plus 10 for "administrative use." The upshot is that MATS stands to get only 15 four-engine aircraft from the Navy.

Whether the Navy will be allowed to keep its 30 big transports is not clear, however. The Dec. 7 directive provides for an annual review of the assignment of transport aircraft to units outside of MATS to determine whether they can be better utilized by the transport organization. This clause may ultimately bring MATS a substantially greater number of four-engine transports—not only from the Navy but from other Air Force units which have managed to tuck away a tidy number of such "administrative use" aircraft over the years. MATS' ultimate fleet, however, will probably never approach 2,000 transports—a figure erroneously given out during the briefing on the December directive and perpetuated in industry statements to Congress.

MATS was also assigned three wings of Douglas C-124s formerly attached to the Troop Carrier Command. These aircraft, 108 in all, together with two airbases formerly belonging to TCC, will be operated by MATS for special troop movements in support of the Army and other services as well as for regular MATS cargo traffic. But they present something of a problem of digestion for MATS since the units supporting them are organized for "sortie" or combat maintenance rather than the continuous, round-the-clock maintenance necessary for an airline type of operation.

This year, as in the past several years, the prospect of industrial funding confronts MATS. This is a scheme for organizing the carrier's bookkeeping along semi-commercial lines. It would literally bill its military customers for transport services it renders, just as its Navy counterpart, the Military Sea Transportation Service, has been doing for a number of years.

Billing rates would reflect the cost of fuel, maintenance, cargo-handling and the like, but not the depreciation of aircraft and other capital equipment. The idea is to give the managers of MATS some hard and fast cost yard-

From actual photo taken a few minutes after Lindbergh took off.

LINDBERGH Lands in Paris on Goodrich Silvertowns

SILVERTOWNS across the sea! Landing on the dependable resilience of Silvertown Airplane Tires, Capt. Charles E. Lindbergh in his Ryan monoplane "Spirit of St. Louis" won his fight with death and distance. The stalwart cushioning of Silvertowns absorbed the landing shock of the first airship to fly from New York to Paris without a stop.

Silvertowns started Lindbergh safely on his way past the dangerous, critical seconds of the take-off at New York.

Silvertowns delivered him safe at Paris — safe from the fateful impact as his eagle plane swooped from the sky, and slammed its wheels down on Europe.

The first thirty seconds of the flight — the last thirty seconds of it!

The first 1,000 feet on the ground after Lindbergh cried "Okay" and they jerked the chuck blocks away from the Silvertown-shod wheels! The last 1,000 feet as the great monoplane hurtled across the Paris landing field.

These were seconds of held breath and tense nerves. Would the tires stand up as the 5,150 pounds of the loaded plane hammered and battered them along the runway? Would they hold the 46-foot wingspread of the eagle ship true to the course?

Would a tire fail in those seconds of grave stress? A blowout spelled the end of the magnificent venture, perhaps with a still greater adventure for the man in the cockpit.

Less than a minute of time, yet an eternity of suspense, the overseas plane thundered along the gauntlet of disaster.

Silvertowns held! Their sinewy strength, their sturdy cushioning stood the stress and strain that had doomed a thousand flights. Capt. Lindbergh soared away safe and landed safe.

Silvertowns met the test as they met it when this unheralded challenger, Capt. Lindbergh, started on his flight from San Diego to New York and made it in less than twenty-three hours.

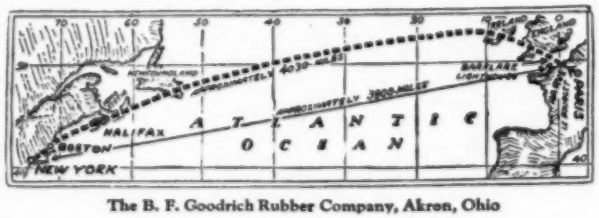
The dash through the clouds to Paris was a matter of gasoline, courage of the intrepid voyager of the skies — and Silvertown tires in the taking off over here and the landing over there.

The "Spirit of St. Louis" sped overseas a perfectly equipped airplane, instruments and parts the nearest to perfection ever assembled.

Captain Charles Lindbergh built it quietly at San Diego, counting on its mechanical perfection as well as his skill and courage to carry through to the goal.

And when it came to tires he fortified the security of his plane with Silvertowns. He underwrote the safety of his venture with the tires that have through years met the test of great moments of competition.

He called to his aid the same flexing strength, the same dependable endurance with which Goodrich Silvertowns have for years served the motor cars of the world.



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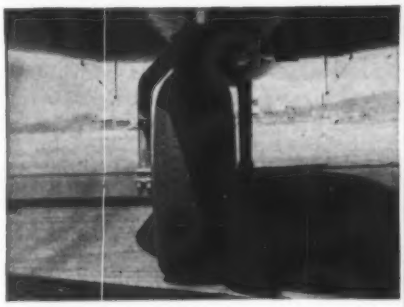
THE MOST SIGNIFICANT development in tires since Lindbergh's flight is Tubeless, pioneered and patented by B. F. Goodrich. Now in service with overseas airlines and military planes, B. F. Goodrich Tubeless sets the pace because it saves weight, performs better.



B. F. Goodrich Tubeless Tires are making greater payloads possible by reducing weight as much as 120 pounds per plane. And while saving weight, BFG Tubeless Tires offer superior air retention, save time and money in warehousing and maintenance. That's why the trend is to B. F. Goodrich Tubeless.

B. F. Goodrich Tires "cross the Atlantic" again on a replica of the SPIRIT OF ST. LOUIS in the Leland Hayward—Billy Wilder motion picture production of Charles A. Lindbergh's Pulitzer Prize-winning story, "THE SPIRIT OF ST. LOUIS"... with JAMES STEWART as Charles A. Lindbergh, presented by WARNER BROS.

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sticks to measure the efficiency of their operation.

Just when MATS will go under an industrial fund is not clear. The December directive says this must take place no later than Jan. 1, 1958, and some Pentagon officials are hopeful that it can be instituted as early as July 1. But if past performance is any criterion, the funding arrangement isn't likely to materialize anywhere near the predicted date.

New equipment is on the horizon for MATS—specifically, the Douglas C-133A logistics transport which is billed as the largest production transport in the world. Now undergoing flight tests at Edwards AFB, Calif., the 100,000-pound-payload machine is scheduled to go to MATS' Dover, Del., base in October with a test crew from Eglin AFB, Fla. It will make a number of transatlantic flights to determine its suitability in the MATS environment.

MATS equipment inventory, including latest acquisitions

USAF Component	
Douglas C-54s (DC-4)	115
Boeing C-97s (Stratocruiser)	46
Douglas C-118s (DC-6)	79
Lockheed C-121s (Super-Constellation)	32
Douglas C-124s (Globemaster)	162
Navy Component	
Lockheed R7Vs (Super-Constellation)	28
Douglas R6Ds (DC-6)	21
Total in service Feb. 28	483
Recent Acquisitions	
Douglas C-124s (Transferred from USAF Tactical Air Command)	108
Lockheed R7Vs and Douglas R6Ds (To be transferred from Navy FLOGWINGS)	15
Overall Total	606
Assigned Total, including aircraft in depot maintenance	625

Just when MATS will get the big transports for its own use is not clear. Originally it hoped to get the first of 12 C-133s this fall, and its first machine was No. 8 on the Douglas line. Now MATS has been dropped to No. 15 to permit Douglas to carry out necessary cockpit modifications. How many MATS will ultimately get has not been disclosed, although MATS officials believe they stand to receive considerably more of the machines than originally scheduled because of the cancellation of the mammoth C-132, an even larger Douglas transport.

The possibility of MATS getting jet transports any time soon isn't bright, despite the fact that its top brass have repeatedly plugged their necessity. One MATS official glumly admits that Air Force requirements for Boeing KC-135 tankers together with roaring commercial demand for jet transports will probably postpone delivery of the speedy transports to MATS until the early 1960s—assuming, of course, that money is available to buy them.

Air Force ends production of Douglas C-132

Air Force has officially terminated the Douglas C-132 transport production program but says the Douglas-Tulsa plant will have sufficient work to maintain most of its present force.

The transport mission will be carried out by the Douglas C-133 and Lockheed C-130. Service life of the present fleet will be extended.

Following the AF announcement, Donald W. Douglas, Sr., president of Douglas Aircraft Co., charged that the cancellation of the contract is a retreat from progress.

European market wide open for U.S. jets, says Beall

Only about half the European market for American-built jet transports has been sold, according to Wellwood Beall, senior vice president for Boeing Airplane Co.

Beall, who recently returned from a sales trip to Europe and Africa, reported that most carriers that have jets on order will have to increase their orders to meet route commitments. Other lines will have to place orders in the near future to keep pace with the competition, he said.

Beall said that KLM is showing interest in the Boeing 717, medium range jet. He said that he believes that South African Airways will order from three to five jet transports this year.

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Eastern asks CAB approval to lease nonskeds' DC-6Bs

Eastern Air Lines has applied to the Civil Aeronautics Board for approval of its agreement to lease seven DC-6Bs from Trans American Airlines. Eastern said the agreement is conditioned upon CAB approval on or before May 29.

Under the agreement Eastern would get the five DC-6Bs now in Trans American possession during May and June. The other two aircraft are slated for delivery to Eastern upon completion of manufacture in April and May 1958.

First five planes are being leased for five years, others for four years. An option permits EAL a single extended lease term of from 12 to 36 months provided all seven aircraft are included in the extension.

Rental terms are $32,500 per airplane per month with a $30,000 security deposit made upon delivery of each plane.

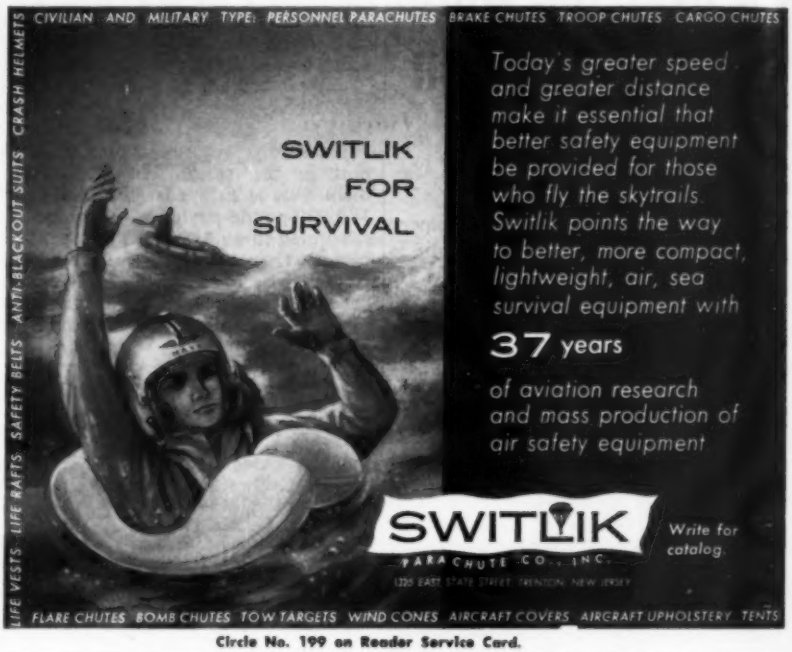
Long Beach Aeromotive pushes expansion program

Long Beach Aeromotive, Long Beach, Calif., is completing the first phases of an extensive expansion program of their overhaul and rebuild facility. A new hangar has been constructed and finishing touches are being put on new metal working, welding, doping, engine buildup and inspection shops.

The work force has been increased to approximately 150 employees and it is anticipated that 50 more will be required by the end of the year.

In addition to overhaul and rebuild contracts for C-46, C-54 and PBY aircraft, the firm has several subcontracts from Douglas Long Beach's C-124 IRAN program.

President of the company is James F. Conroy.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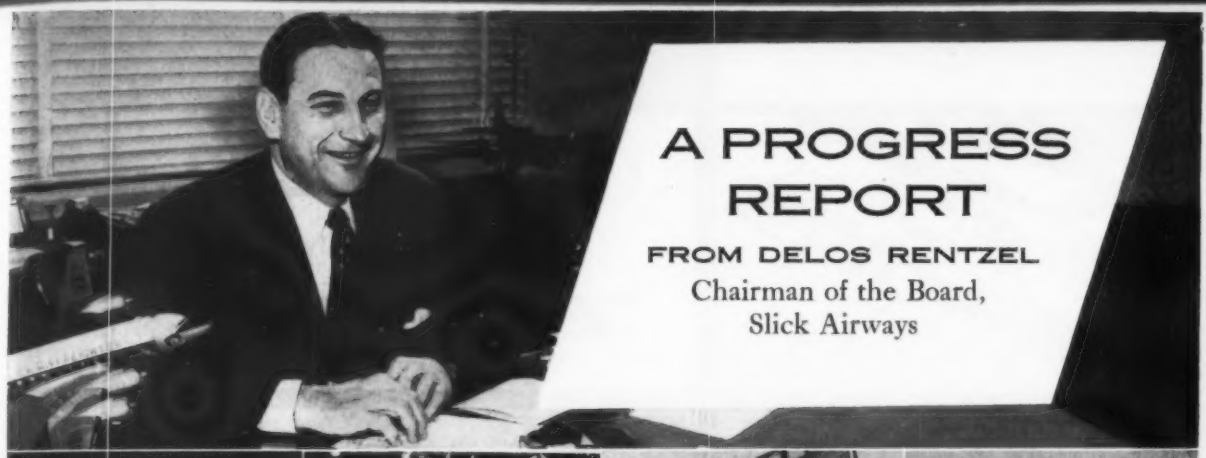


A PROGRESS REPORT

FROM DELOS RENTZEL

Chairman of the Board,
Slick Airways

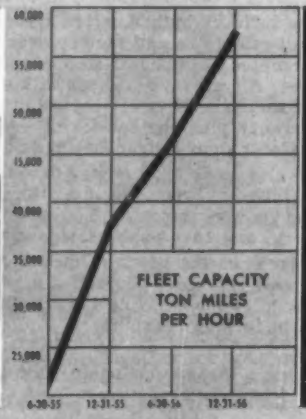
"1956 was a year of accomplishments for Slick Airways... It was the year Robert J. Smith joined us as president.

"It was also the year that we moved our General Offices to Dallas to serve the Nation's shippers better.

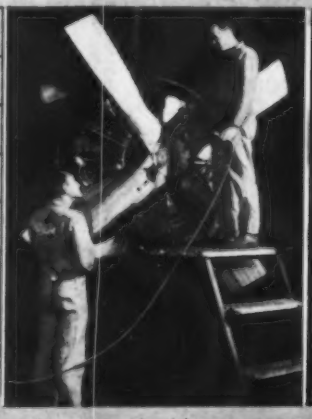
"We instituted our Sky Van program which now makes the air shipment of household goods really practical.

"Our Charter and Contract Division flew nearly 200,000,000 passenger miles...a new record for us.

"In 1956, the Live Cargo Division developed a portable loading ramp that went a long way in helping us set a record for live cargo movement.

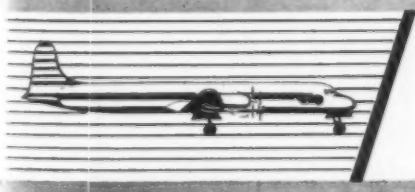


"We have expanded the Slick fleet's capacity with additional DC-6 and DC-4 aircraft; this really 'gave us a lift' as shown by the graph above.



"At our overhaul base in San Antonio, over 400 employees 'Kept 'Em Flying' with their work on R-1300 engines for the Air Force and Army.

"And now in 1957 we embark on SurfAir...coordinated surface air transport that will bridge over 5,000 hitherto remote communities."



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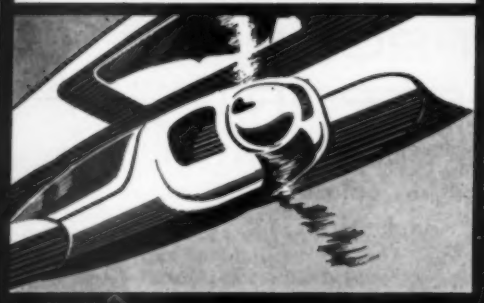

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Air Force won't give up Logair to Army

By Lois C. Philmus

DEFENSE SECRETARY WILSON'S single management policy has never won any popularity contests among the military services. But single managers in some areas have been swallowed, if not digested. Military resistance has been strong, but reluctant compliance has always followed.

However, "mutiny" has finally erupted. Rebellion has been raging since last fall with the USAF refusing to surrender Logair—unique Air Materiel Command contract airlift—to the Military Traffic Management Agency under Army jurisdiction. MTMA's directive empowers it to decide when and what commercial transportation to employ for movement of 10 or more military personnel and cargo operations. It further is assigned to negotiate and award all contracts for domestic air and surface carriers as needed.

The broad powers of the directive were aimed directly at Logair. USAF considers Logair to be an intrinsic, inseparable component of the Air Materiel Command. Its function is to serve domestic USAF modern weapons system bases where the missions' functions require decreased inventory and fast movement. Logair substitutes airlift for dead storage. In calendar 1956, contractors flew over 100 million ton-miles.

Arbitration is useless as far as the Air Force is concerned. It will allow no one but AMC to run the airlift. A Defense official told AMERICAN AVIATION that a final ruling would shortly be issued, with several possibilities under consideration. The most obvious and peaceful solution, observers feel, would be for MTMA to exercise its delegation rights. Under this clause, MTMA could delegate to AMC the right to continue to negotiate, contract and operate its strategic airlift.

USAF's "Gibraltar" position was clearly enunciated by Brig. Gen. Emmett Cassady, AMC transportation director, earlier this year: "We don't propose to give up Logair to anyone. The service must be scheduled, reliable and centrally managed. Simplicity is the key to the operation and in case of emergency, it's as flexible as a rubber band. You can't tie a 1,000-mph machine to a 'Hannibal' system."

He added confidently that he was "sure Logair will not be interfered with in any manner."

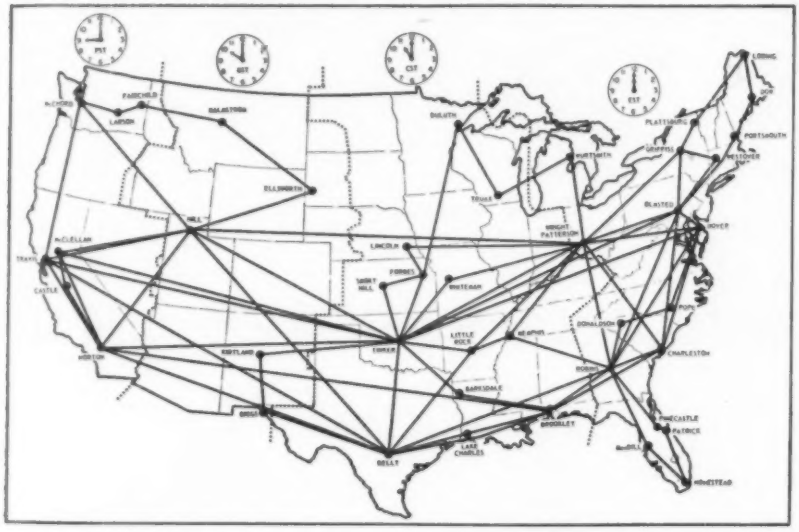
Logair was originally established to support the superbombers at Strategic Air Command Bases. It has since expanded and is feeding four Air Defense Command early warning bases in northern U.S., as well as some Tactical Air Command and Air Research and Development Command facilities. It also functions as a feeder system to points of embarkation where the Military Air Transport Service picks up the relay to serve overseas areas.

Central control and routing is mapped at AMC's Dayton headquarters at Wright-Patterson Field. Each Air Materiel Area has specific support assignments.

Logair from its inception on April 1, 1955, was a contract operation. Fiscal 1957 contracts are held by Resort Airlines, Riddle Airlines, American Export & Import Co., and Capitol Airways. Resort won the C-54 contract for coast-to-coast service with a minimum volume of 43.7 million ton-miles guaranteed. The other three won C-46 contracts for shorter hauls, with a combined tonnage guarantee of 113 million tons.

All contracts are awarded under competitive bidding. All but Capitol had operated under contracts in fiscal 1956 also. In an attempt to build up continuity and encourage equipment investment, the annual contract was slightly modified to include a two-year option.

AMC has estimated that each contractor is paid about an average of 13.8¢ per ton-mile, believed to be the



LOGAIR—Air Materiel Command's scheduled cargo airline—fiscal 1957 route structure incorporated four Air Defense Command northern early warning bases, Tactical Air Command and Patrick AFB's missile test center, in addition to Strategic Air Command bases for which it was created.

LOGAIR: figures for 1955-'56-'57

FISCAL YEAR	TONS	COST	MI. FLOWN	TON-MI. FLOWN	COST PER TON-MI.
1955	44,598	$ 5,315,500	7,120,803	42,524,000*	$0.125**
1956	97,828	14,000,372	17,616,511	95,711,822	.146
First half 1957	63,453	8,349,791	11,508,775	59,289,263	.141

** Computed from cost/ton-mile*
*** Average monthly rate*

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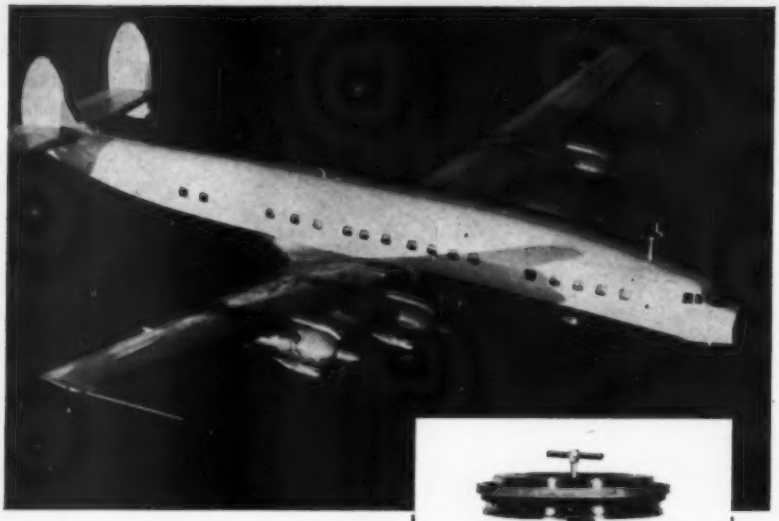

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lowest air freight cost. While it is felt that an all-military operation could possibly be simpler and more efficient, the evident economies of the contract system preclude any such adaptation.

Fiscal 1958 plans for Logair call for adding to the number of modern weapons systems bases served and for increasing frequency of schedules. Some are now served on a daily schedule and some every three out of five days. However, the objective is to provide daily service to all Century and B-52 bases. Missile support by Logair is under consideration, with the missile test center at Patrick AFB on an experimental scheduled route.

AMC requested $23.9 million for Logair operation compared to the estimated $18 million to be spent in the current fiscal year. How this request fared in the overall tightening of the final USAF budget can't be ascertained at this time.

Deep in AMC's thinking is a latent idea of extending Logair worldwide. It was tried two years ago for about a month but Logair was slapped down. The premise is that worldwide bases should be served on a schedule similar to the domestic operation under contract.

MATS' prerogatives would be invaded, of course, but it would provide a continuity not now available. It is felt that in event of emergency Logair would be the logical group to take over the entire logistic support.

However, the latent idea will probably remain as such. Particularly in view of MATS' designation as the single airlift agency for all the military services. One observer even pointed out that another compromise in the Logair-MTMA deadlock is to turn Logair over to the single airlift agency.

Temco to develop Corvus, Navy missile system

The $16-million Navy contract awarded Temco Aircraft Corp. provides for the development of a complete missile system called Corvus, according to Gary Evans, head of the company's XKDT-1 target drone development.

Corvus (Latin for crow) is a large air-to-surface weapon. The missile apparently will be built at the Garland plant which is slated to receive divisional status under Temco reorganization.

Evans also revealed that the XKDT-1 drone will be powered by a solid-propellant engine developed by Phillips Petroleum Co. It will produce 50 pounds of thrust for eight minutes and will accelerate the air-launched drone to an average speed of Mach .95.

Cost of the drone, which is competing with one under development by Radioplane Co. for a Navy contract, is placed at about $5,000. Price would be less in large volume production.

Evans said that Temco also is working on a supersonic drone.

new

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Air taxi service: small business, big potential

by Bernard Brown

MOST AIR TRAVELERS — even many who fly regularly on business— aren't aware that they can arrange to be flown by "air taxi" to virtually any small town in the U.S. that has an airport.

It's easy enough to get from New York to Washington by commercial airline, for example. But it's not so easy to get from Washington to Woodstock, Va., 95 miles west, or to Gettysburg, Pa., 80 miles north.

The obvious answer is to take an air taxi: average cost, 20 cents a mile per person.

Despite the lack of public awareness, some 150 members of the National Air Taxi Conference are doing a thriving business, hope to do even better as more air travelers learn of their existence. There reportedly are about 1,300 operators throughout the U.S.

In the 12-month period ended Sept. 30, 1956, a total of 87,319 passengers were flown by members of NATC to various off-line destinations in the U.S. Air taxi operators made 26,546 trips, of which 23,549 were for passenger-carrying purposes, 3,459 for cargo and 161 for ambulance-type medical emergencies.

They flew 7,491,242 revenue passenger-miles. At an average rate of 20 cents per mile, that meant a volume of $1,498,248. Admittedly, this puts air taxi in the category of small business, but that doesn't disturb members of the trade. In the seven years their organization has been in existence, volume of business has grown steadily.

Air taxi service is not new. But prior to February, 1950, when the National Air Taxi Conference was organized, it was a helter-skelter business. It began mushrooming after World War II, when a few former Air Force pilots discovered they could rent out aircraft profitably on an irregular charter basis.

As more businessmen who regularly flew commercial airlines began to wonder how they could cut travel time from large cities to small towns not on airline routes, demand for air taxi service grew. With commercial helicopter flying service largely in the talking stage, independent operators of lightplanes, some of whom conducted flying schools, began to fill the demand.

It wasn't too long before the need for an organization became apparent. Many operators wanted to establish standards of safe, prompt and efficient operation and at the same time reach a working agreement with the regularly scheduled airlines whereby their services could be brought to the attention of regular airline users.

NATIONAL AIR TAXI CONFERENCE
Report on operations for the period
October 1955 through September 1956

REVENUE TRIPS

	Total	Passenger	Cargo	Ambulance
Oct. '55-Sept. '56	26,546	23,549	3,459	161
Oct. '54-Sept. '55	27,135	21,810	5,134	227
Jan. '54-Sept. '54	16,856	15,536	1,799	151

REVENUE MILES

	Total	Passenger	Cargo	Ambulance
Oct. '55-Sept. '56	5,923,002	7,491,242	277,235	160,032
Oct. '54-Sept. '55	5,622,401	6,388,603	285,569	160,856
Jan. '54-Sept. '54	3,792,210	5,794,883	315,674	101,434

PASSENGERS CARRIED

	Total	To Airlines	From Airlines	Other
Oct. '55-Sept. '56	87,319	5,951	6,017	76,477
Oct. '54-Sept. '55	79,534	5,655	6,251	67,684
Jan. '54-Sept. '54	44,366	3,537	3,704	19,808

1955-1956	1954-1955	Jan. thru Sept. 1954
Number of Injuries	0	2	0
Number of Fatalities	0	2	1
Load Factor: (Approx.) ...	3.7	3.6	2

NATC was the result. Organized as a cooperative association with headquarters in Washington, D.C., it is now in its seventh year. Through an interline agreement, NATC members and airline members of the Air Traffic Conference of America sell each other's services.

Major objective of NATC is to establish an integrated national air transport system that will reach into every community in the U.S.

Each member of NATC is licensed by the Civil Aeronautics Board as a certified air taxi operator. His service is distinguished by the sign of the flying kangaroo that may now be found at most major airports throughout the U.S.

Air Taxi Co., Red Bank, N. J., headed by Walter Laudenslager, a past president of NATC, is one of the most prosperous aerial hackers in the U.S. It also operates an air ambulance service in the metropolitan New York and New Jersey areas. It averages 25 calls a day, sometimes handles as many as 40.

Not long ago Laudenslager's service flew an ambulance case from Acapulco, Mexico, to a hospital in New York City. Trip cost the passenger $4,200, probably an all-time high for air ambulance service.

One of the busiest air taxi operators in the country is Avalon Air Transport, Inc., which carries an average of more than 2,000 passengers a month between Los Angeles and Catalina Island in its five nine-passenger Grummans. William R. Probert, president of Avalon, reports his company carried 48,173 passengers last year, more than half of all the passengers flown by air taxis in 1955.

A survey conducted by the National Aviation Trades Assn. in 1953 showed that the average investment of an operator was about $33,000. Number of planes operated at that time ranged from two to six. Only a few operators employed more than 30 persons, while 70% employed seven or fewer.

Last summer NATC got its first helicopter-flying member when Helicopter Air Lift Division of Skymotive, Inc., operating out of Chicago's O'Hare Field, joined up. As helicopter service comes into greater use, more operators will follow the example of the Chicago service. Newest copter-flying member is Miller Air Taxi of Pittsburgh.

Prices of air taxi service are not

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G. T. BAKER. *President*

NATIONAL AIRLINES, INC.

low. About the shortest flight a traveler might require would cost $15. Other flights range up to $270, but that's for six passengers.

Red Bank's Air Taxi Co. has set up rates for nine zones of operation radiating as far north as Rutland, Vt. and as far south as Crisfield, Md. Zones are 25-mile circles around the geographical center between Newark, LaGuardia, Idlewild and Teterboro airports.

Rates are for the airplane, which means three may fly in a Beech Bonanza or Piper Apache, or six in a Twin Beech. There are charges for excess waiting time, extra landings and overnight layovers.

Rates are 20 cents a mile for a Bonanza, whether it is flying three passengers or 600 pounds of cargo. Rates for an Apache, which carries either three passengers or 700 pounds of cargo, are 40 cents a mile, and for a Twin Beech, which may carry six passengers or 1,200 pounds of cargo, 60 cents a mile.

These rates are fairly typical, though not all air taxi operators have worked out their fees in such detail. For example, Air Taxi, Inc., operating out of Curtiss-Wright Airport and Gen. Mitchell Field in the Milwaukee area, charges $60 for a one-way trip to Antigo, Wis., in a single-engine Cessna 180, which carries three passengers and takes one hour, or $111 in a twin Cessna 310, which carries four and requires only 45 minutes.

Night rates are higher

Unlike the regular air carriers, taxi operators are likely to charge more for night flying. Air Taxi, Inc. of Milwaukee charges $32 for a daytime flight to Appleton, Wis., in a Cessna 180, $59.20 in a Cessna 310 and $64 for a night flight in either plane.

NATC has agreements with Hertz and National Rent A Car to provide ground transportation services for its air travelers.

The association will hold its convention jointly with the National Aviation Trades Assn. at the Adolphus Hotel in Dallas Nov. 13, 14 and 15.

Gen. LeMay to become AF vice-chief of staff

Gen. Curtis LeMay will become Air Force Vice Chief of Staff succeeding Gen. Thomas White who moves into the number 1 spot this summer.

Speculation concerning who would replace General LeMay as boss of the Strategic Air Command centers on Lt. Gen. Emmett (Rosie) O'Donnell, deputy chief of staff for personnel. Another possibility is Gen. Laurence S. Kuter, presently commander of the Far East Air Forces.

Exact date of General LeMay's transfer has not been established since there is a conflict in dates in when the post of Chief of Staff will be filled.

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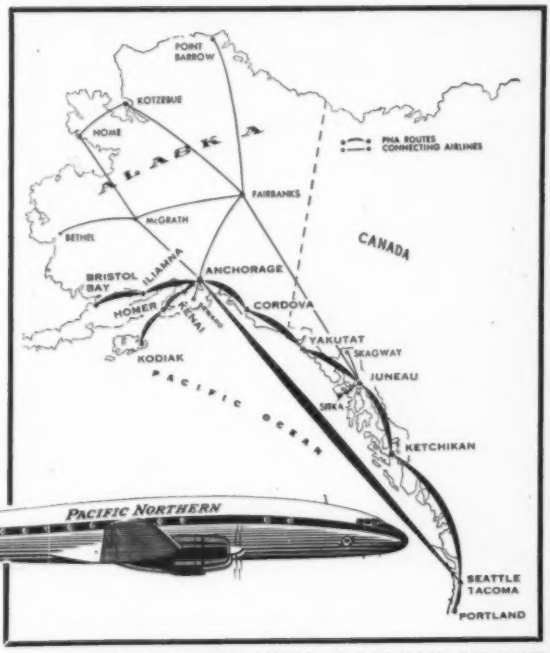

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TRATEGIC WEAPON—Closely shrouded in secrecy during years of development and testing, the Snark SM-62, like the powerful queen in chess, is an important strategic weapon. The Snark, America's first intercontinental guided missile, is now scheduled for delivery to the Strategic Air Command of the U.S. Air Force. Designed to deliver a nuclear warhead to a target 5,000 miles from its mobile launching platform, the Snark is a strong deterrent to any aggressor. Like the new Northrop T-38 supersonic jet trainer, the Snark was developed with Northrop's realistic understanding of national defense budget limitations. These, and other weapon systems designed and produced by Northrop, are examples of the continued corporate effort to aid the defense department in maintaining "security with solvency" by using the best resources of science and technology to develop low-cost solutions to defense problems.

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Airline		Revenue Passenger(s)			Ton-Miles Flown		Revenue		Net Profit or Loss
		Miles Flown (000)	Psgrs. Carried (000)	Load Factor (%)	Air Cargo (000)	Revenue Mail (000)	Total Operating $000	Passenger $000	$000
Aerolineas Argentinas	1956	262,140	445	66.43%	2,889	115	7,965	6,851	(4,575)
	1955	222,236	334	69.27%	2,457	123	5,726	4,735	(3,615)
Aeronaves de Mexico	1956	162,248	391	69.79%	NA	NA	7,228	6,056	33
	1955	143,429	384	67.09%	NA	NA	6,554	5,420	28
Air-India International	1956	210,701	76	64.3 %	5,223	2,357	14,206	9,851	137*
	1955	143,342	51	57.9 %	3,507	1,645	10,139	6,916	689*
Alitalia (Italy)	1956	134,830	116	54.6 %	1,794	794	NA	NA	NA
	1955	107,275	82	55.4 %	1,430	743	11,507	NA	204
Aviacion Y Comercio (Spain)	1956	55,876	226	74 %	186	286	NA	NA	NA
	1955	44,991	220	76 %	174	281	2,221	1,771	131
Avianca (Colombia)	1956	276,404	942	60 %	18,858	1,096	97,875	67,738	2,244
	1955	268,322	904	59 %	18,070	1,223	82,379	56,422	2,533
Braathens SAFE (Norway)	1956	9,669	49	65.6 %	24	20	NA	NA	NA
	1955	8,298	33	66.1 %	81	17	NA	NA	NA
British European Airways	1956	794,345	2,436	69.3 %	8,017	3,258	NA	NA	NA
	1955	688,011	2,157	70.2 %	6,317	3,188	58,369	48,919	4,463
British Overseas Airways Corp. (BOAC)	1956	1,165,135	388	65.0 %	30,112	18,174	124,000	86,000	NA
	1955	991,009	341	61.8 %	25,234	16,573	108,000	72,000	NA
Canadian Pacific Air Lines	1956	264,366	273	NA	11,605	1,047	NA	NA	NA
	1955	195,731	276	NA	7,285	1,011	NA	NA	NA
Central African Airways	1956	107,242	188	69 %	714	340	6,259	5,311	38
	1955	82,893	154	68 %	680	302	5,494	4,743	(158)
Deutsche Lufthansa (Germany)	1956	179,657	229	52 %	2,547	1,653	19,000	14,500	(4,800)
	1955†	48,224	70	42.8 %	548	640	5,300	NA	NA
El Al Israel	1956	83,726	39	60.90%	1,705	353	NA	NA	NA
	1955	85,711	37	64.43%	1,584	310	NA	NA	NA
Ethiopian Airlines	1956	33,261	71	52.5 %	1,699	79	4,238	2,669	318
	1955	30,618	67	57.8 %	1,683	66	3,888	2,441	280
Finnair (Finland)	1956	84,965	333	56.0 %	753	221	7,934	6,644	27
	1955	71,503	273	58.4 %	471	165	5,425	4,432	11
Flugfélag (Iceland)	1956	21,803	67	50.3 %	423	66	NA	NA	NA
	1955	16,830	53	61.18%	307	57	1,760	1,273	(18)
Garuda Indonesian Airways	1956	85,186	447	75 %	3,565	1,425	23,498	18,426	NA
	1955	82,795	408	75.6 %	3,360	1,281	20,275	15,722	NA
Guest Aerovias Mexico	1956	45,458	37	48.51%	326	35	NA	NA	NA
	1955	31,999	27	45.19%	325	29	NA	NA	NA
Hunting—Clan Air Transport (U. K.)	1956	29,734	8	76.05%	7,486	NEGL.	NA	NA	NA
	1955	24,496	7	74.97%	1,129	NEGL.	NA	NA	NA
Iberia (Spain)	1956	280,565	673	65.6 %	906	599	NA	NA	NA
	1955	247,835	577	63.0 %	784	592	13,668	12,389	786
Indian Airlines	1956	209,827	500	NA	15,323	3,041	16,294	9,160	2,487
	1955	188,676	478	NA	13,457	2,816	13,884	7,624	1,878
Japan Air Lines	1956	256,645	367	73.3 %	3,580	1,776	18,485	13,273	1,403
	1955	195,281	300	66.4 %	2,312	1,283	13,239	10,322	(1,965)
KLM (Netherlands)	1956	1,177,453	822	61.5 %	40,062	6,149	114,378	80,020	6,065
	1955	1,041,677	725	59.7 %	33,851	5,652	99,083	67,754	4,988
Linea Aeropostal Venezolana	1956	123,567	254	51.3 %	15,605	502	14,436	10,102	NA
	1955	119,004	236	49.6 %	14,051	489	13,660	9,275	NA
Loftleidir (Iceland)	1956	59,224	22	58.15%	438	55	3,064	2,760	31
	1955	47,330	17	59.04%	334	37	2,684	2,433	14
Qantas Empire Airways (Australia)	1956	414,864	157	62.0 %	10,159	8,329	NA	NA	NA
	1955	307,123	129	60.0 %	9,169	6,827	32,969	16,557	899
Scandinavian Airlines System	1956	812,796	753	57.2 %	13,301	5,334	74,000	NA	2,019
	1955	674,669	604	54.4 %	12,054	5,114	63,650	NA	1,615
Swissair	1956	380,244	774	64.5 %	7,361	2,360	33,403	25,308	617
	1955	321,996	631	63.9 %	5,638	2,163	28,461	21,808	409
TAE National Greek Airlines	1956	43,209	180	57.3 %	557	91	NA	NA	NA
	1955	36,160	144	54.2 %	539	83	NA	NA	NA
Tasman Empire Airways (New Zealand)	1956	69,146	54	75 %	300	272	5,338	NA	233
	1955	59,025	44	NA	NA	NA	NA	NA	243
Trans-Australian Airlines	1956	374,576	773	70.2 %	9,639	653	21,948	17,181	679
	1955	350,778	740	71 %	9,847	653	19,667	14,992	495
Trans-Canada Airlines	1956	1,191,784	2,073	73.1 %	14,476	8,613	94,045	74,652	1,602
	1955	969,392	1,682	70.2 %	12,118	7,704	79,741	62,938	196
Transportes Aeros Portugueses	1956	47,709	42	46 %	330	544	166	115	NA
	1955	35,216	33	62 %	176	335	109	79	NA
U. A. T. Aeromaritime (France)	1956	201,857	125	66 %	8,914	956	NA	NA	NA
	1955	190,923	127	66.2 %	9,432	1,044	NA	NA	NA
Varig (Brazil)	1956	220,880	511	51 %	10,564	245	18,666	12,064	47
	1955	154,084	425	45.04%	9,307	143	11,561	7,031	31

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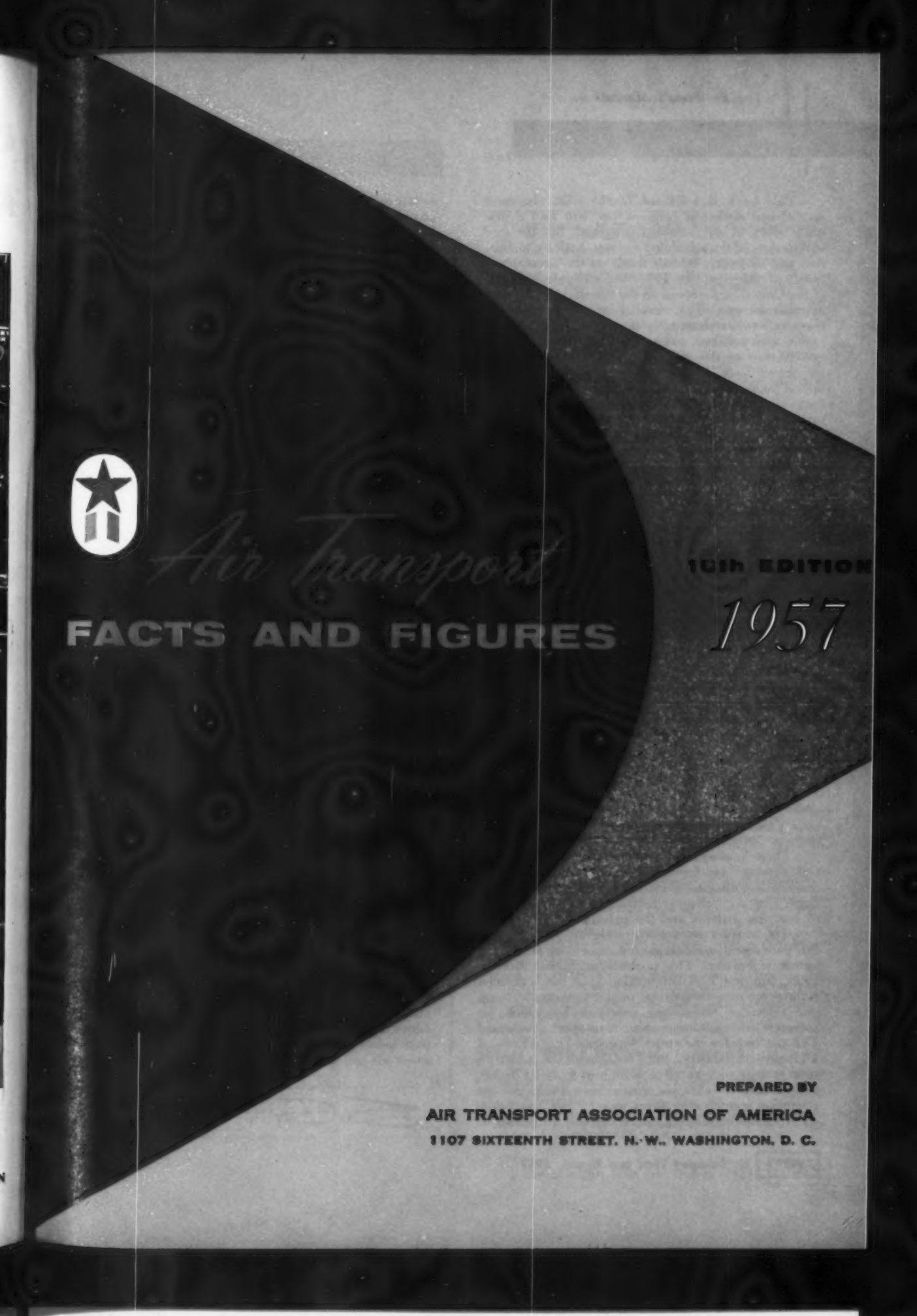

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10th EDITION

1957

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1107 SIXTEENTH STREET, N.W., WASHINGTON, D. C.

THE JOB AHEAD

This book is a record of the past. In these factual and statistical columns you will find a dramatic story of air transport progress. But the men and women of the scheduled airlines, both by inclination and necessity, seldom dwell on the accomplishments of the past. In 1957, the scheduled airlines of the United States stand on the threshold of the civil aviation jet age. This revolution in transportation may well revise drastically the pattern of our economic and political and social life.

So far as the airlines are concerned there is no turning back. By the end of 1956, they had committed themselves to more than $2,600,000,000 to be spent over the next 5 years for new turbo-prop and turbo-jet airliners that will move people and cargo faster, accelerate the mails and add new and more powerful wings to our national defense.

But to bring these benefits to the public, the airlines face new and complex problems, both technological and economic, that have been thrust upon them. At stake is our nation's world leadership in aerial commerce and the very feasibility and vigor of its air power, in peace and war.

Most immediately critical is the problem of air navigation and air traffic control. We have almost run out of a precious natural resource, the air space itself. In addition, the air traffic control system is inadequate to handle even today's air fleet. More radar and other known electronic aids must be employed to provide some interim improvement of the present system. But beyond this, we need a whole new system concept geared to the traffic of tomorrow, that will increase rapidly in numbers and complexity, to provide adequate control of all air traffic at all times. Of course, any modern system must contemplate the unique and elaborate demands of the military and so must be far more expensive than civil aviation alone requires.

Equally important is the need for improvement and development of our nation's airports, those highly valued gateways by which each local community will enter or maintain its position in the air age.

These problems of adequate air traffic control and airport facilities are everybody's for they are concerned with vital service to the nation's air defense, our air transport network, the growing fleets of business aircraft and the private flyers.

The airlines are concentrating on better service for passengers and cargo but they face a serious economic barrier. This problem magnified itself in 1956. For the 19th consecutive year the scheduled airlines set new records for public usefulness. Revenue ton-miles flown—the yardstick by which we measure the usefulness of air transport—increased 15.6 per cent for the entire American-Flag scheduled air transport industry. But even though the industry's total revenues hit an all-time high of $1,861,175,000, an increase of 13.9 per cent above 1955, the net operating income after taxes was 7.2 per cent below 1955 due to continuing rising costs in all phases of airline operation. This steadily narrowing gap between growth and net income means that the airlines are becoming progressively more vulnerable financially.

The grim fact is that constant technological improvements and intensive management efficiency, which built today's vast airline network, are no longer sufficient to combat the inflation trend of our nation's economy. This has focused attention anew on the fare structure of the airlines.

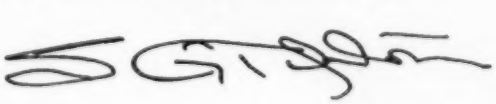
Since the passage of the Civil Aeronautics Act of 1938, the birth certificate of the organized scheduled air transport industry as we know it today, the airlines have maintained a policy of swallowing cost increases to keep fares low. Actually air transportation today costs the air traveler less per mile than it did in 1938. During this same period, while the average fare has been held down, the industry has doubled—and in many instances tripled—its usefulness in every phase of its service to the public.

The revenue problem is complicated by regulation. Scheduled air transport is the most closely regulated and highly competitive public service industry there is and competition is constantly increasing. For instance, new service has been authorized between 320 pairs of cities during the past two years. Further, in the case of 64 city pairs, already served by two, three or four competing airlines, more service was added. Beyond this, at the end of 1956, 33 foreign carriers were flying into this country in direct competition with many of our own carriers for overseas business.

The fare and airline cost problem will be in the spotlight for months to come. One thing is certain—to hold the fare line at the expense of improvements in service is not in the best interest of the public or the air transport industry.

The scheduled airlines also must constantly improve equipment because of their responsibilities to our national security. The airlines feel they can provide an even greater contribution to the national defense than is presently provided for in the Civil Reserve Air Fleet (CRAF) program if they are permitted to perform a greater share of the routine carriage of military personnel and cargo. This will permit the Air Force to devote more of their trained men and resources to such combat activities as SAC and ADC, reduce the over-all load on the taxpayer, and create a greater airlift potential in case of national emergency. These beneficial results can be obtained if a closer working partnership is developed with the military.

The job ahead is to unscramble these problems and face the future with the competence and confidence that have enabled the U. S. scheduled air transport industry to build the largest, finest, fastest and safest air transportation system in the world.



Air Transport

FACTS AND FIGURES

18th Edition, 1957

This index covers material demonstrating the increasing use of U. S. scheduled air transportation in the post war years. Revised data filed by the scheduled air carriers with the Civil Aeronautics Board and the records of the Interstate Commerce Commission served as the major sources of the statistics.

Aircraft Operated 25
Aircraft Operating Expenses 15
Aircraft Operations at CAA Operated Towers 26
Air Navigation and Traffic Control 8
Alaskan Carriers 6
All Cargo Airlines 7
Assets, Liabilities and Capital 20
Classes of U. S. Commercial Air Carriers 27
Commerce 4
Directors of Air Transport Association ..... Back Cover
Domestic Trunklines 5
Fares, Average Passenger 24
Ground and Indirect Expenses 17
Helicopter Carriers 6
Intercity Passenger Mile Market 23
International 6
Local Service 6
Mail 7
Members of Air Transport Association ..... Back Cover
National Defense 8
New Type Aircraft in Scheduled Service 25
Officers of Air Transport Association ..... Back Cover
Operating Revenues 13
President's Message 2
Profit or Loss Summary 18
Resources 9
Revenue Passengers Carried 24
Revenue Ton-Mile Traffic Carried 11
Safety Records 26
Service Available and Utilized 10
Territorial Carriers 6

Definition of Terms

Passenger Miles and Ton Miles

AVAILABLE SEAT MILES FLOWN. Total seat miles available for sale in scheduled service.

AVAILABLE TON MILES. Total ton miles of lift capacity available for sale in scheduled and charter service.

CHARTER FLIGHT. Transportation of passengers or property on other than scheduled and designated extra section flights.

EXPRESS TON MILE. A ton of express flown one mile.

FREIGHT TON MILE. A ton of freight flown one mile.

PASSENGER MILE. One passenger flown one mile.

PASSENGER LOAD FACTOR. The percentage of available seat miles actually sold in scheduled serivce.

PASSENGER TON MILES. Passenger miles converted to ton miles. (See definition of revenue ton miles.)

REVENUE PASSENGER MILES. The number of fare paying passengers flown times the length of trip in miles. This is the amount of available seat miles sold.

REVENUE PLANE MILES. Aircraft miles flown in scheduled service.

REVENUE TON MILES. The ton miles sold in scheduled and charter service. In the construction of this traffic measure passenger miles are converted to ton miles on the basis of about 10 to 1. That is, ten passengers with allowable free baggage are accepted as equalling one ton.

SEAT MILE. One passenger seat, filled or unfilled, flown one mile.

TON MILE LOAD FACTOR. Percentage of available ton miles sold in scheduled and charter service.

U. S. MAIL TON MILE. A ton of mail flown one mile. The statistic includes priority air letter mail and air parcel post. Since the beginning of the experiment on flying first-class (three-cent) mail by air, such non-priority mail has also been included in U. S. Mail Ton Miles.

Revenues and Profit and Loss

EXPRESS REVENUE. Revenues accrued from the carriage of express.

FREIGHT REVENUE. Revenues accrued from the carriage of freight.

INCOME TAXES. Federal income taxes.

NET INCOME BEFORE TAXES. The net income to the business from all transactions. In addition to airline net operating income this includes such items as net profit from the sale of equipment, proceeds from the ownership or sale of investments, revenues of separately operated divisions, revenue from the rental or contractual operation of aircraft, and profit or loss on the exchange of foreign currency.

NET OPERATING INCOME. The total operating revenue from air transportation services less the operating expenses (see definition of Operating Expenses). Net Operating Income is before taxes and interest charges and does not include the nonoperating items in Net Income Before Taxes (see above).

NET PROFIT OR LOSS. Net income after Federal income taxes—the amount available for dividends or investment in the business. This figure is subject to change because of the later adjustment of some accounting transactions and through revision of mail rates and subsidy by regulatory action.

OPERATING EXPENSES. The expenses incurred in the conduct of the business except for such items as debt financing and other non-operating items identified above in Net Income Before Taxes.

OTHER REVENUE. All other revenues, including excess baggage, chartered services, foreign mail, penalties for failure to cancel reservations, service charges on non-revenue transportation of employees and special services such as photography and crop dusting.

PASSENGER REVENUES. Passenger revenues from scheduled operations.

PUBLIC SERVICE REVENUES. Payments by the Federal Government to insure air service to communities in the United States and its territories which could not otherwise afford it; to maintain essential international air routes which are not yet self-supporting; and to develop helicopter service.

U. S. MAIL REVENUE. Service revenue for the transportation of mail. This is the amount paid by the Post Office to purchase air transportation for mail, and is not subsidy.

EVER-GROWING
PUBLIC USEFULNESS
SINCE 1938
All classes of Certified Air Carriers
1938
1956
percent increase
Number of Airlines
Cities Served
Airplanes in Service
Seats Available (Daily)
Cruising Speed of Fastest Transport
Number of Passengers Carried
Number of People Employed
Total Airline Payrolls
Air Mail Ton Miles
Average Fare
1 These figures include international cities as well as domestic points and 10 Hawaiian cities; in addition 241 Alaskan points were served in 1956 and 12 in 1938 making a total of 954 cities in 1956 compared to 298 in 1938.
2 As of 6/30/56.
3 Domestic Trunk.

COMMERCE

The scheduled airlines of the United States today fly more than 61 per cent of the entire free world's air passenger traffic.

Under a doctrine of regulated competition established by the Civil Aeronautics Act of 1938 the airlines have built the finest, fastest, most reliable and most competitive—as well as the safest—air transportation system in the world.

Progress in Equipment

The combined fleets of the nation's scheduled airlines by the end of 1956 totaled 1,726 aircraft, representing an investment of more than half a billion dollars.

Speeds have increased. In the time it took the air traveler in 1938 to go from New York to Chicago, today's passenger can fly all the way from New York to Denver.

Capacity is greater. Biggest of today's four-engined airliners can carry five times as many passengers as the twin-engined airliners of 1938. Passenger-wise, all of today's airliners could provide seats for every man, woman and child in a city of 80,000 population. At the same time, they could carry 3,116 tons of mail, express and freight.

Progress in Services Provided

In 1938, half the nation's total population was without any air service at all. Today the nation is spider-webbed with airline routes tying together some 546 U. S. cities, big metropolitan centers and small rural areas. International operations link the U. S. with some 157 cities in 58 different foreign countries. Few localities are without air service of one kind or another.

Competition is increasing. There are almost three times as many certificated scheduled airlines today as there were in 1938. Over-all domestic revenue plane miles flown are up 852 per cent today over the 1938 figure. The average number of daily plane miles flown for all domestic and territorial airlines in 1938 was 198,000. The figure was 1,884,000 in 1956.

The number of airlines serving individual cities has increased greatly since 1938. Today, as many as 18 carriers serve the major terminals like New York and Chicago. In fact, in the past 17 months, competition between carriers was greatly intensified. Competition was added to one-third of the air traffic of the United States with as many as six additional carriers certificated to operate between two cities. In fact, from one to six additional carriers were certificated for 320 city pairs.

The value of the services which the airlines perform is indicated by increased spending on airline travel. In the past ten years, for example, the American public has demonstrated its faith and acceptance of air transportation by buying airline travel at a greater average yearly rate of increase—18 per cent—than any other type of personal purchase.

Safety has helped build this public confidence. In the ten years from 1947, airline accident fatality rates have shown a drop of almost 80 per cent. Moreover, safety record comparisons show that air travel

is, in fact, five times as safe as riding in your own automobile.

What the public is buying today in air transportation is a post-war luxury service at pre-war fare levels. In 1939, the airlines' first full year of operation under the Civil Aeronautics Act, an air passenger paid $44.95 for a ticket from New York to Chicago. (There was only first-class service available.) Flying time was four hours and 35 minutes. Today's air traveler can make the same trip using air coach or air tourist services for only $33.00, a reduction from 1939 fares of more than 25 per cent. The flight takes only two hours and 55 minutes. And today's passenger —whether first-class or coach—rides in an airliner that is far superior to the best of 1939.

Progress Toward Self-Sufficiency

In 1939 mail pay in the form of subsidy, or public service revenue, was a major source of airline income. By comparison, in 1956, public service revenue paid to the airlines represented only 2.3 per cent of their gross income. The domestic trunklines were almost entirely free of subsidy.

And mail pay is no longer a form of subsidy. In fiscal 1939, the domestic scheduled airlines grossed $47,683,759. Public service revenue or subsidy represented 25.9 per cent of this amount.

By comparison, in 1956, public service revenue paid to all the airlines represented only 2.3 per cent of their gross income. The domestic trunklines were almost entirely free of subsidy. Only the local service airlines, certain segments of international routes, the territorial airlines and the new helicopter services still receive public service revenue.

Milestones of 1956

The scheduled airlines carried their 300,000,000th passenger in 1956. Behind this statistic is a far more significant fact than the number itself. It took 24 years for the airlines to carry the first 100,000,000 passengers, four more years to count the second 100,000,000 but only a little over two years to hit the 300,000,000 mark.

Comparing 1956 figures with 1955, the number of passengers carried showed an increase of 10.4 per cent. In 1956, for the second time since the end of the Korean action, the scheduled airlines were solely responsible for a 3.5 per cent increase in the domestic intercity passenger traffic carried by the country's commercial transportation system.

The year showed gains in every type of service which the airlines provide. During 1956, the airlines carried 152,098 ton-miles of air mail, an increase of 10.7 per cent over 1955. Air express shipments increased from 51,285,000 ton-miles in 1955, to 52,278,000 ton-miles in 1956. Air freight jumped from 382,847,000 ton-miles carried in 1955, to 434,256,000 ton-miles carried in 1956.

In the twelve month period, the airlines added 238 airliners to their combined fleets, increasing their capacity to airlift passengers, mail, express and freight by 15.6 per cent.

During the year the industry grossed $1,856,231,000, an increase of 13.6 per cent over the previous year. But, although each individual carrier did more business, operational earnings failed to follow suit, and in some instances losses appeared. Profit margins still lagged substantially behind other public service industries.

At the same time, the industry has committed itself to an additional $2,600,000,000 in orders for more piston-engined aircraft and new jet liners. By year's end, this total number of new aircraft on order totaled 670.

DOMESTIC TRUNKLINES

The domestic trunklines during 1956 carried 81.8 per cent of the total number of passengers who flew on the schedued airlines. Passenger business for the domestic trunks was up 11.8 per cent and accounted for 90.4 per cent of the total trunkline revenues.

Air coach and air tourist services accounted for 35.9 per cent of the domestic trunkline passenger traffic. First-class service saw a rise of 12.6 per cent.

The trunklines also carried 60.3 per cent of the total air mail ton-miles. Carriage of the mail, by the ton-mile yardstick, was 6.6 per cent over the previous year's figures.

Air express ton-miles showed a gain of 0.2 per cent. Total air freight movements on a ton-mile basis showed a gain of 9.5 per cent.

During the year public service revenues dropped 18.2 per cent from the 1955 figure and amounted to less than .2 of one per cent of their total revenues.

INTERNATIONAL

U. S. Flag Carriers during 1956 accounted for 65 per cent of all passengers between the U. S. and foreign countries. During the heavy vacation travel months of June, July and August, the airlines flew more passengers to Europe than went by surface vessel.

The year's totals showed a 10.2 per cent increase in the number of passengers arriving via American international carriers from foreign countries. At the same time, the number of passengers they carried abroad was 10.1 per cent higher than in 1955.

Air coach and air tourist travel to and from the U. S. increased by more than 19 per cent during the year. The low-fare flights accounted for 64 per cent of the international passenger business. First-class traffic increased 9 per cent.

There were also important changes in the international route structure during 1956. The CAB, in permitting two of the U. S. overseas carriers to fly an inter-change operation across the Pacific, in effect, gave the U. S. a second round-the-world air route. One new foreign airline was granted entry into the U. S. and began operations. Another foreign airline began flying a trans-polar service with terminal points in the U. S. Of the total $42,736,000 in public service revenues granted the scheduled airlines in 1956, $8,123,000 went to the international carriers to fly routes in the government's interest.

LOCAL SERVICE

Created as a whole new family of airlines just after the end of World War II, the Local Service Carriers celebrated their tenth full year of operation in 1956. The decade produced many measurements of progress.

By the end of 1956 they had carried 100 times the number of passengers in the past twelve month period as they carried ten years ago. The gain in passenger traffic over 1955 was 21 per cent. Likewise, they have increased their gross revenues eight times since 1947. The increase in 1956, over 1955, was 17.7 per cent with total revenues in last year amounting to $67,380,000.

Although the local service airlines carried only one per cent of the total mail tonnage in 1956, it is significant to point out that without them some 192 U. S. cities would be without any direct air mail service.

The fact that they are making such a contribution to the nation's postal and transportation system accounts for the larger slice which they receive from public service revenue. In 1956 this figure was $22,933,000. The previous year it was $20,714,000. Indicative of their growing importance, however, is the fact that ten years ago they carried 25,000 pasengers, while in 1956 they carried 3,453,000—an increase of 13,712 per cent.

HELICOPTER CARRIERS

In 1956, scheduled helicopter airlines carried a total of 63,000 passengers and 135,000 ton-miles of mail and other cargo. Passenger service showed a gain of 152 per cent over 1955. During the year new and larger helicopters were put into operation. The helicopter passenger, used to riding in a rotorcraft with a capacity for carrying only five persons now can ride in helicopters that can carry 12 passengers. Although a limited number of new helicopters went into service during 1956, the number of seats available on a daily basis increased 98 per cent.

Because it costs more to fly a ton of passengers, mail or cargo by helicopter than it does to airlift the same load in a DC-7 airliner, the helicopter services are getting 5.6 per cent of the public service revenue dollar to help expand their operations. In 1956 this subsidy amounted to $2,544,000. However, public service revenue dropped 6.1 per cent from the 1955 figure.

ALASKAN CARRIERS

During 1956 Alaskan carriers, stimulated by new business in support of the DEW-line radar network, showed 31.4 per cent increase in total revenue. Available ton miles increased 52.4 per cent over 1955. Biggest traffic increase was in charter flights which jumped 151 per cent. The total number of passengers carried showed a 19.3 per cent increase. There was an 11 per cent increase in subsity.

TERRITORIAL CARRIERS

Over-all revenues for the Territorial Carriers in 1956 showed an increase of 4.4 per cent while subsidy declined .7 per cent from the 1955 figure. Total passenger revenue was up 6.3 per cent. Freight revenues increased four per cent from the 1955 level. Charter

traffic was off 47.1 per cent. Mail showed an increase of .9 per cent.

ALL-CARGO AIRLINES

The all-cargo airlines in 1956 carried 13.3 per cent more freight traffic than they did during the previous twelve-month period. Available ton-miles of the all-cargo carriers increased from 184,521 in 1955 to 284,512. Charter business accounted for the greatest gains in the all-cargo field, 42 per cent of the total revenue ton miles flown. This was an increase of 242 per cent over 1955.

MAIL

The Civil Aeronautics Act of 1938, also said that the scheduled airlines must serve the postal system of the United States.

Since then, public use of the air mail service in the United States, which the scheduled air transport industry provides under contract with the Post Office Department, has increased 1,169 per cent. The airlines, for example, carry today in 50 days the number of air mail letters that they carried in fiscal 1938.

In the beginning, carrying out their responsibility of speeding the mails, the scheduled airlines relied heavily on public service revenues. This was a major source of revenue for the young industry. In 1956, however, total mail pay received by the whole scheduled airline industry amounted to only 3.4 per cent of the industry's gross revenue.

More important is the way the revenues from the air mail stamp are split today as compared with the breakdown in 1938. Then the airlines got 94.5 per cent of the stamp revenue, the Post Office kept 5.5 per cent. In fiscal 1956, the airlines got 17.2 per cent of the stamp revenue, while the Post Office kept 82.8 per cent.

Total revenues generated by the use of air mail (letters, cards and parcel post) for both domestic and international service returned $176,000,000 to the Post Office while the airlines received $61,000,000 for carrying the mail.

In addition, last year, through a special arrangement with the Post Office Department, the airlines on a space available basis carried more than 4,300,000 first-class letters daily between certain cities along

their domestic routes. And this "Three-Cent Air Mail Experiment," as it is called, in 1956, saved billions of hours in delivery time for millions of letter writers. Millions of letters reached their destinations an average of 12 hours sooner than had they traveled by surface means.

Started in 1953, the three-cent mail by air has proven highly successful. The total carriage of three-cent mail on a ton-mile basis was 15,013,000 ton-miles for fiscal 1956, or 19.8 per cent of total ton-miles of domestic mail flown by air. By the end of June 1956, after 33 months of the experiment, the airlines had received a total of $6,745,000 for carrying the three-cent letters between the points affected, less than .2 cents per letter carried. During the same period the service had generated a total of over $100,000,000 in revenue for the Post Office.

The experiment is a success, although the airlines are not certain they are being compensated enough for the service rendered.

At the same time, this does not mean that the regular six-cent air mail doesn't offer a superior service. It does. Regular air mail letters get special handling from the moment they are taken from the mail box. Furthermore, the six-cent air mail stamp is a guarantee that the letter goes by air, even at the expense of turning away passengers if the payload is too heavy. Air mail gets priority over all other types of cargo. The three-cent letter goes by air only when there is space available.

The airlines have also put wings on parcel post packages. Inaugurated on September 1, 1948, use of air parcel post has increased 277 per cent in seven years. The number of pieces flown, both domestic and international, in 1956, was 24,201,198, a gain of 11.9 per cent over the previous year.

NATIONAL DEFENSE

The airlines are constantly ready to augment airlift necessary to the nation's striking military air arm.

The planes, crews and maintenance support which the airlines contribute to the Civil Reserve Air Fleet (CRAF) program save hundreds of millions of dollars in tax monies which otherwise would have to be spent for maintaining emergency airlift on a stand-by basis.

Contributing to the CRAF program—a joint military-airlines operation born of the lessons learned in World War II, the Berlin Airlift and Korea—the scheduled carriers, alone, have 314 four-engine airliners earmarked for CRAF.

The scheduled airlines made available an additional 24 of their biggest and best airliners to CRAF in 1956. The new planes represent a daily increase of more than 1,600,000 ton-mile airlift capacity, bringing the total CRAF capability up to 7,276,160 available ton-mlies per ten-hour day.

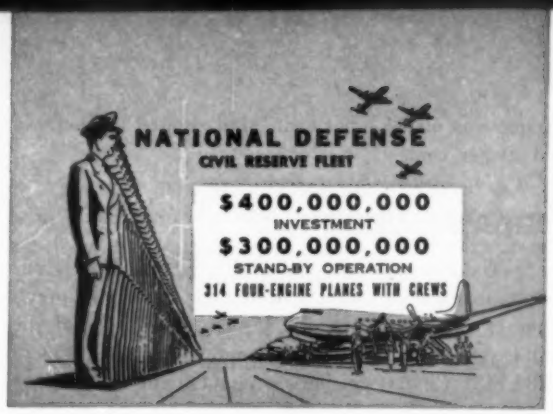
The total equipment value of the scheduled airline share in CRAF is estimated at more than $400,000,000. To operate such a fleet on a stand-by basis would cost the government something like $300,000,000 a year.

In addition to their CRAF contribution, the scheduled airlines in 1956 stepped up their activities to provide more and better service to the military organizations using civil air transportation.

The scheduled airlines provided the military agencies with 922,728,874 passenger-miles of official travel in 1956. This is the equivalent of flying 37,000 troops around the world at the equator. For the past seven and a half years the scheduled airlines have effectively served the military departments, in peace and emergency, through the Military Bureau of the Air Transport Association and its field offices.

The scheduled airlines have established over 60 offices at military installations called JAMTO's (Joint Airline Military Traffic Office). These offices, under the jurisdiction of local military committees of the industry, assist in making arrangements for movement of both cargo and personnel.

As an aftermath to the Hungarian Freedom uprisings, a JAMTO was established at reactivated Camp Kilmer. This JAMTO worked around the clock to assist the welfare agencies handling refugees in the domestic transportation to relatives and sponsors.



AIR NAVIGATION AND TRAFFIC CONTROL

Back in 1936, the scheduled airlines devised and put into practice the first system of air traffic control in this country. The operation was embryonic. But it worked and it set the basic pattern for the traffic control system in use today. The true significance, however, is the fact that almost 21 years ago the airlines themselves recognized the problem which today affects everyone who flies.

Today's vast and complicated Air Navigation and Traffic Control System is the direct responsibility of the Federal Government. And the airlines have never held back in contributing to the further development of the system and its upkeep—both in know-how and techniques, and in financial support.

The scheduled airline fleet of over 1,726 planes represents only about 1.6 per cent of the planes using the Federal Airways as they share the system with some 40,000 military planes and another 60,000 private and corporate aircraft.

The nation's air traffic control system is the heart of our national defense air network. Our bombers would not be able to strike, nor our fighters able to defend without it. And these big users of the airways system must have priority for the nation's security. Consequently, the system must be one which can integrate all segments of aviation—the private flyer, the business flyer, the commercial operator and the military—into a common system. It costs many times more than any system which might be required by the airlines alone.

America's system of Air Navigation and Traffic Control is the finest, safest and most extensive network of aerial highways in the world. The only thing wrong is that the system itself has been unable to

keep pace with the tremendous increases in the number of planes that use it.

The problem is to allocate the required amount of airspace to all users, and then effectively control the traffic using it. The growth of aviation has outstripped our ability to control effectively our present volume of air traffic with the present air traffic control system.

The need is for immediate improvement of the present system to insure safe operation of today's aircraft—an interim system. And beyond this, the need is for a whole new approach to the problem and the development of a completely new system that can handle the expected traffic increases and the bigger and faster planes that are coming.

Admittedly, no method of controlling air traffic exists today which will adequately serve tomorrow's planes, in tomorrow's numbers, flying at tomorrow's speeds.

The need for these improvements and a continuing effort to solve the air navigation and traffic control problem was clearly demonstrated on June 21, 1956. On that day, adverse weather conditions taxed the present system to its limits. Over 31 per cent of all airline operations in the eastern half of the United States were cancelled or delayed. And other elements of aviation, including the military, suffered accordingly. It shouldn't have happened. But it did. And it is a striking example for the need of improving the situation.

RESOURCES

Although the scheduled airlines have demonstrated startling increases in providing more and better air service, their ability to earn profits for themselves has lagged far behind their capability to serve the public. Airline profits are way out of balance when they are weighed against the progress the industry has accomplished. Earnings are far below the margins of return of other public service industries. To bring the benefits of jet travel to the public, it is going to be increasingly difficult for the airline industry to pay off its indebtedness unless something is done to improve this earnings trend.

And this becomes even more evident when one considers the estimated net worth of the industry, set at $650,000,000 in 1956, and the $2,600,000,000 already committed for jetliners and other aircraft over the next five years.

IN THE LAST DECADE
...about 82% of all funds available to the airlines has gone into new equipment.
82%
FOR NEW EQUIPMENT
ONE DOLLAR

Because the technological advances in aeronautical equipment have been so rapid, the airlines have been forced, time and again, into costly re-equipment programs.

For example, if you take trunkline funds from all sources—earnings, sales of additional stock, borrowings, depreciation, property retirements and other amortizations—you come up, for the last ten years, with about $1,760,000,000. Some 82 per cent—$1,448,000,000—of that money was ploughed back into new and better equipment.

Security analysts tell us that a growth industry, such as scheduled air transport, ought to be paying out about 40 per cent of its net income, after taxes, in dividends. The airlines, in the same ten year period, paid out about 32 per cent of net profits after taxes. The comparable figure for all U. S. corporations was 47 per cent of net profits after taxes.

The continuing need for a tremendous outlay of dollars for new equipment is pointed up by the increasing cost of the equipment itself.

In 1946, for example, the largest four-engined airliner then available cost about $625,000. A similar airliner in 1956 was selling for $1,150,000. But, the bigger, faster, four-engined airliners last year cost about $2,000,000 each. The cost per plane of the biggest new jetliners on order will hit $6,250,000, which is fifty times the cost of the DC-3 airliner 20 years ago.

Operating expenses of the scheduled airlines amounted to $1,727,677,000 in 1956, an increase of 15.9 per cent over 1955. In spite of a 15.6 per cent increase in traffic gross profits of the industry were only $133,498,000 in 1956 or a decrease of 7.2 per cent from the previous year.

U. S. Scheduled Airline Industry, *1947-1956 (In Millions)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Domestic Trunk Airlines										
Available Ton Miles Flown	1,209.7	1,357.9	1,517.4	1,684.1	1,974.1	2,399.3	2,893.3	3,314.1	3,882.7	4,392.8
Revenue Ton Miles Flown	689.1	706.2	809.0	963.2	1,204.7	1,413.5	1,644.3	1,857.6	2,190.6	2,452.5
Ton Mile Load Factor (%)	56.97	52.01	53.31	57.20	61.02	58.91	56.83	56.05	56.42	55.83
Available Seat Miles Flown	9,152.4	9,980.2	11,117.7	12,385.6	14,672	18,068.1	22,114.4	25,646.5	30,001.3	33,752.6
Revenue Passenger Miles Flown	6,016.3	5,822.4	6,570.7	7,766.0	10,210.8	12,120.8	14,297.6	16,246.3	19,217.2	21,643.1
Passenger Load Factor (%)	65.73	58.34	59.10	62.70	69.59	67.08	64.65	63.31	64.06	64.12
Revenue Plane Miles Flown	311.9	316.3	323.2	327.1	362.5	411.4	467.0	497.2	564.0	622.1
Local Service Airlines										
Available Ton Miles Flown	14.9	31.5	46.4	62.4	81.5	96.2	109.3	112.9	121.9	145.6
Revenue Ton Miles Flown	4.7	9.1	14.3	20.9	31.6	36.1	40.7	47.2	55.0	66.5
Ton Mile Load Factor (%)	31.87	28.92	30.93	33.51	38.79	37.53	37.28	41.77	45.14	45.70
Available Seat Miles Flown	155.5	323.9	477.9	599.2	774.7	905.4	1,013.6	1,069.7	1,161.4	1,385.1
Revenue Passenger Miles Flown	46.4	87.9	134.7	188.8	289.6	339.2	390.9	449.5	523.3	633.2
Passenger Load Factor (%)	29.85	27.14	28.18	31.51	37.39	37.46	38.56	42.02	45.06	45.72
Revenue Plane Miles Flown	10.1	18.0	24.5	33.0	38.0	41.1	45.6	47.7	50.9	59.5
Territorial Airlines										
Available Ton Miles Flown	8.3	9.1	10.1	10.9	13.8	14.2	15.9	15.7	16.1	16.0
Revenue Ton Miles Flown	4.9	5.2	5.3	5.8	6.6	7.0	7.4	7.7	8.8	8.8
Ton Mile Load Factor (%)	59.91	57.12	52.47	52.75	47.86	49.49	46.70	49.17	54.25	54.80
Available Seat Miles Flown	65.9	81.0	91.3	100.1	119.0	124.1	134.6	134.5	134.7	147.2
Revenue Passenger Miles Flown	46.8	52.9	52.6	57.7	65.8	67.9	71.8	72.7	78.1	83.9
Passenger Load Factor (%)	71.10	65.28	57.19	57.66	55.27	54.72	53.37	54.04	57.99	56.99
Revenue Plane Miles Flown	3.1	3.6	4.0	4.3	5.0	5.4	4.9	4.7	4.6	4.6
Helicopter Airlines *(in thousands)*										
Available Ton Miles Flown	14	108	142	189	185	181	350	388	434	574
Revenue Ton Miles Flown	3	28	46	63	71	75	129	152	192	281
Ton Mile Load Factor (%)	18.43	25.93	32.39	33.33	38.38	41.44	36.86	39.18	44.24	48.95
Revenue Passenger Miles Flown	.....	.....	.....	.....	.....	.....	191	716	1,708	3,387
Available Seat Miles Flown	.....	.....	.....	.....	.....	.....	26	183	628	1,583
Passenger Load Factor (%)	.....	.....	.....	.....	.....	.....	13.61	25.56	36.77	46.74
Revenue Planes Miles Flown	37	284	412	668	619	631	1,006	1,071	1,148	1,323
International and Overseas Airlines										
Available Ton Miles Flown	425.8	480.8	540.3	554.2	608.4	693.7	760.5	856.1	982.6	1,146.9
Revenue Ton Miles Flown	243.7	273.5	300.4	325.4	377.8	426.3	466.8	527.1	622.4	728.1
Ton Mile Load Factor (%)	57.24	56.89	55.60	58.17	62.09	61.45	61.38	61.57	63.34	63.48
Available Seat Miles Flown	2,924.3	3,292.3	3,624.7	3,695.5	4,361.4	4,848.8	5,462.2	6,284.9	7,012.1	8,073.2
Revenue Passenger Miles Flown	1,810.0	1,888.9	2,054.0	2,206.4	2,599.0	3,019.8	3,381.1	3,743.3	4,409.6	5,116.4
Passenger Load Factor (%)	61.90	57.37	56.67	59.71	59.59	62.28	61.90	59.56	62.89	63.38
Revenue Plane Miles Flown	86.5	98.1	104.5	93.8	97.4	103.4	109.6	116.1	130.7	146.0

AVAILABLE SERVICE AND UTILIZATION *(continued)*

U. S. Scheduled Airline Industry, *1947-1956 (In Millions)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Alaskan Airlines										
Available Ton Miles Flown		20.1	20.3	19.7	15.8	26.7	34.1	34.5	46.0	66.9
Revenue Ton Miles Flown		12.8	11.1	10.1	8.5	14.4	19.5	19.4	29.4	44.7
Ton Mile Load Factor (%)	Not	63.64	54.76	50.93	54.16	53.89	57.23	56.37	63.83	66 85
Available Seat Miles Flown	Available	42.6	38.9	54.0	82.4	168.8	209.2	206.3	233.9	284.1
Revenue Passenger Miles Flown		19.6	15.4	22.4	36.5	71.2	92.4	86.9	110.4	136.9
Passenger Load Factor (%)		46.10	39.64	41.60	44.26	42.18	44.15	42.15	47.20	48.20
Revenue Plane Miles Flown		4.6	3.9	5.4	6.9	9.3	10.4	9.6	10.5	11.3
All Cargo Airlines'										
Available Ton Miles Flown	.....	.....	16.5	80.2	126.2	118.6	121.8	108.8	184.5	284.5
Revenue Ton Miles Flown	.....	.....	11.6	59.5	103.6	97.0	99.3	88.6	136.0	216.8
Ton Mile Load Factor (%)	.....	.....	70.52	74.20	82.10	81.82	81.51	81.48	73.70	76.19
Available Seat Miles Flown	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Revenue Passenger Miles Flown	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Passenger Load Factor (%)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Revenue Plane Miles Flown	.....	.....	2.9	13.3	19.9	18.5	19.1	12.6	20.3	25.5
Total Scheduled Airline Industry										
Available Ton Miles Flown	1,658.7	1,899.5	2,151.1	2,411.6	2,819.9	3,348.9	3,935.3	4,442.5	5,234.2	6,053.3
Revenue Ton Miles Flown	942.4	1,006.8	1,151.8	1,384.9	1,732.8	1,994.3	2,278.2	2,547.8	3,042.4	3,517.7
Ton Mile Load Factor (%)	56.82	53.29	53.54	57.43	61.45	59.55	57.89	57.35	58.13	58.11
Available Seat Miles Flown	12,298.1	13,720.0	15,350.5	16,834.4	20,009.5	24,115.2	28,934.6	33,342.6	38,545.1	43,645.5
Revenue Passenger Miles Flown	7,919.5	7,871.7	8,827.4	10,241.3	13,201.6	15,618.9	18,233.8	20,598.9	24,339.2	27,615.1
Passenger Load Factor (%)	64.40	57.37	57.51	60.84	65.98	67.77	63.02	61.78	63.14	63.27
Revenue Plane Miles Flown	411.6	440.9	463.1	477.6	530.3	589.7	657.6	689.0	782.1	870.4

' Riddle and AAXICO data not included in 1956.

REVENUE TON-MILE TRAFFIC CARRIED

by U. S. Scheduled Airline Industry, *1947-1956 (in Thousands of Revenue Ton-Miles)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Domestic Trunk Airlines										
Passenger	579,859	558,680	632,014	747,558	982,642	1,167,556	1,377,728	1,568,413	1,856,196	2,091,517
Freight	35,214	70,438	94,190	112,861	100,581	117,128	131,778	144,276	174,023	190,597
U. S. Mail	32,879	37,510	40,874	46,315	62,932	68,296	71,725	80,201	86,034	91,686
Express	28,553	29,769	27,329	36,538	40,260	40,375	42,514	40,122	49,608	49,711
Charter Flights	5,774	3,158	7,483	8,203	8,576	8,593	6,874	8,317	5,730	5,884
All Other	6,875	6,657	7,102	11,782	9,680	11,512	13,706	16,288	19,049	23,060
Total	689,134	706,212	808,992	963,257	1,204,671	1,413,460	1,644,325	1,857,617	2,190,640	2,452,455

REVENUE TON-MILE TRAFFIC CARRIED *(continued)*

by U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Local Service Airlines										
Passenger	4,316	8,184	12,908	18,242	27,904	32,373	36,767	42,396	49,442	59,862
Freight	62	265	436	696	920	1,116	1,179	1,158	1,355	1,625
U. S. Mail	165	334	428	566	787	912	1,000	1,226	1,257	1,572
Express	118	190	320	623	908	894	954	1,043	1,403	1,688
Charter Flights	59	90	194	653	961	653	649	1,108	1,338	1,487
All Other	18	39	60	118	132	168	198	224	245	312
Total	4,738	9,102	14,346	20,898	31,612	36,116	40,747	47,155	55,040	66,546
Territorial Airlines										
Passenger	3,839	4,309	4,309	4,680	5,234	5,354	5,806	5,929	6,599	6,991
Freight	636	581	618	529	855	1,258	1,503	1,657	1,646	1,477
U. S. Mail	43	53	70	65	59	50	57	58	58	65
Express	116	134	124	119	100	55	.....	.....	.....	.....
Charter Flights	184	39	123	304	283	272	27	45	436	235
All Other	68	68	66	56	50	49	46	34	20	19
Total	4,886	5,184	5,310	5,753	6,581	7,038	7,439	7,723	8,759	8,787
Helicopter Airlines										
Passenger	.....	.....	.....	.....	.....	.....	2	17	57	145
Freight	.....	.....	.....	.....	.....	.....	2	5	5	7
U. S. Mail	3	28	46	63	71	75	123	115	96	92
Express	.....	.....	.....	.....	.....	.....	.....	13	31	36
All Other	.....	.....	.....	.....	.....	.....	2	2	3	1
Total	3	28	46	63	71	75	129	152	192	281
International and Overseas Airlines										
Passenger	184,303	194,399	211,734	228,114	266,989	310,716	345,383	379,787	442,808	511,673
Freight	2,110	4,012	6,714	16,050	71,004	72,346	74,427	81,886	89,598	109,227
U. S. Mail	12,756	17,203	19,772	21,188	21,875	22,068	24,466	35,323	52,409	55,155
Express	30,786	41,581	49,444	44,513	289	281	219	217	243	.....
Charter Flights	5,275	7,990	3,233	5,730	6,724	7,846	7,700	13,790	19,701	32,370
All Other	8,483	8,314	9,515	9,825	10,903	13,051	14,583	16,136	17,647	19,690
Total	243,713	273,499	300,412	325,420	377,784	426,308	466,778	527,139	622,406	728,115
Alaskan Airlines										
Passenger	.....	1,962	1,543	2,245	3,743	7,490	9,838	9,139	11,752	14,617
Freight	.....	1,027	618	882	1,763	4,252	5,908	5,998	7,300	7,955
U. S. Mail	.....	281	479	741	970	1,591	1,987	2,058	2,379	2,381
Charter Flights	.....	9,509	8,449	6,095	2,016	955	1,640	2,086	7,773	19,532
All Other	.....	40	27	90	51	99	114	114	149	243
Total	.....	12,819	11,116	10,053	8,543	14,387	19,487	19,395	29,353	44,728

REVENUE TON-MILE TRAFFIC CARRIED *(continued)*

by U. S. Scheduled Airline Industry, *1947-1956 (in Thousands of Revenue Ton-Miles)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
All Cargo Airlines										
Passenger	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Freight	.....	.....	10,542	58,420	78,578	92,367	88,812	76,653	108,920	123,368
U. S. Mail	.....	.....	.....	.....	.....	.....	.....	.....	322	1,147
Express	.....	.....	.....	.....	.....	.....	.....	.....	.....	843
Charter Flights	.....	.....	1,124	1,125	25,038	4,670	10,517	11,988	26,758	91,415
Excess Baggage	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	11,666	59,545	103,616	97,037	99,329	88,641	136,000	216,773
Total Scheduled Airlines Industry										
Passenger	772,317	767,534	862,508	1,000,839	1,286,512	1,523,489	1,775,524	2,005,681	2,366,854	2,684,805
Freight	38,022	76,323	113,118	189,438	253,701	288,467	303,609	311,633	382,847	434,256
U. S. Mail	45,846	55,409	61,669	68,938	86,694	92,992	99,358	118,981	142,555	152,098
Express	59,553	71,674	77,217	81,793	41,557	41,605	43,687	41,395	51,285	52,278
Charter Flights	11,292	20,786	20,606	22,110	43,598	22,989	27,407	37,334	61,736	150,923
All Other	15,444	15,118	16,770	21,871	20,816	24,879	28,649	32,798	37,113	43,325
Total	942,474	1,006,844	1,151,888	1,384,989	1,732,878	1,994,421	2,278,234	2,547,822	3,042,390	3,517,685

[1] Riddle and AAXICO data not included in 1956.

OPERATING REVENUES

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Domestic Trunk Airlines										
Passenger	$ 303,194	334,736	378,113	430,098	570,288	671,257	775,782	872,834	1,021,853	1,142,124
Freight	$ 8,358	13,825	18,323	21,698	21,030	25,529	29,341	33,009	39,605	42,166
U. S. Mail	$ 23,326	47,838	45,031	46,311	37,040	35,910	37,083	37,315	30,130	34,202
Express	$ 10,530	9,964	8,957	12,569	14,706	15,853	16,829	15,107	19,405	18,057
Other	$ 7,082	6,990	9,359	13,433	15,457	19,466	19,758	19,953	22,355	26,209
Total	$ 352,490	413,353	459,783	524,109	658,521	768,015	878,793	978,218	1,133,348	1,262,758
Local Service Airlines										
Passenger	$ 2,280	4,667	7,362	10,303	16,259	19,766	23,306	27,673	32,840	40,139
Freight	$ 17	76	138	212	309	405	462	502	556	746
U. S. Mail	$ 5,920	10,911	13,533	16,581	18,850	21,177	24,356	24,893	21,896	24,050
Express	$ 43	72	114	230	357	417	463	496	665	774
Other	$ 151	195	271	544	966	614	771	1,151	1,279	1,671
Total	$ 8,411	15,921	21,418	27,870	36,741	42,379	49,358	54,715	57,236	67,380

[1] Preliminary data.

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Territorial Airlines										
Passenger $	3,102	3,888	3,799	4,105	4,639	4,433	4,771	5,270	5,685	6,042
Freight $	321	302	333	288	393	562	692	732	752	782
U. S. Mail $	162	189	247	285	643	768	1,128	640	338	341
Express $	108	134	145	125	119	63	.....	.....	.....	.....
Other $	208	137	254	410	418	420	135	148	338	265
Total $	3,901	4,650	4,778	5,213	6,212	6,246	6,726	6,790	7,114	7,430
Helicopter Airlines										
Passenger $	.....	.....	.....	.....	.....	.....	10	63	205	440
Freight $	.....	.....	.....	.....	.....	.....	4	16	21	29
U. S. Mail $	37	372	522	791	887	1,033	2,547	2,878	2,948	2,776
Express $	.....	.....	.....	.....	.....	.....	.....	35	95	114
Other $	.....	.....	.....	7	5	13	44	78	82	63
Total $	37	372	522	798	892	1,046	2,605	3,070	3,351	3,422
International and Overseas Airlines										
Passenger $	140,652	151,338	158,480	160,673	184,592	212,458	232,539	254,234	294,824	347,613
Freight $	689	1,370	2,105	5,881	25,116	26,730	27,257	29,614	31,854	36,774
U. S. Mail $	32,300	57,332	75,197	55,689	53,213	51,553	53,746	49,192	27,223	35,306
Express $	16,837	19,438	20,023	15,783	94	87	74	70	77	.....
Other $	18,532	19,756	18,350	22,105	24,784	24,110	23,670	25,739	30,324	38,064
Total $	209,010	249,234	274,155	260,131	287,799	314,918	337,286	358,849	384,302	452,757
Alaskan Airlines										
Passenger $	.....	2,492	2,188	2,758	4,042	5,857	6,815	6,479	8,162	10,188
Freight $	.....	529	547	639	928	1,474	1,851	1,837	2,464	2,761
U. S. Mail $	.....	1,530	2,122	2,939	3,742	7,524	9,060	9,226	7,954	8,719
Other $	.....	3,798	3,639	3,102	3,430	1,106	1,574	1,662	3,747	7,671
Total $	.....	8,349	8,496	9,438	12,142	15,961	19,300	19,204	22,324	29,339
All Cargo Airlines[2]										
Passenger $	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Freight $	.....	.....	1,810	8,850	12,017	14,498	14,825	13,958	18,634	23,586
U. S. Mail $	.....	.....	.....	.....	.....	.....	.....	.....	57	497
Other $	.....	.....	300	3,511	5,348	2,549	4,391	3,001	8,336	14,008
Total $	.....	.....	2,110	12,361	17,365	17,047	19,216	16,959	27,027	38,090

[1] Preliminary data.

[2] Seaboard and Western data not included in 1956.

OPERATING REVENUES *(continued)*

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Total Scheduled Airline Industry										
Passenger	$ 449,228	497,121	549,942	607,937	779,820	913,771	1,043,223	1,166,553	1,363,569	1,541,545
Freight	$ 9,385	16,102	23,256	37,568	59,793	69,198	74,432	79,668	93,886	106,843
U. S. Mail	$ 61,745	118,172	136,652	122,596	114,375	117,945	127,920	124,144	91,869	195,891
Express	$ 27,518	29,608	29,239	28,707	15,276	16,420	17,366	15,708	20,246	18,945
Other	$ 25,973	30,876	32,173	43,112	50,408	48,278	50,343	51,732	65,137	87,951
Total	$ 573,849	691,879	551,262	839,920	1,019,672	1,165,612	1,313,284	1,437,805	1,634,707	1,861,175

[1] Preliminary data

DISTRIBUTION OF AIRCRAFT OPERATING EXPENSES

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Domestic Trunk Airlines										
Flying Operations	$ 85,933	104,164	119,961	132,060	160,469	193,384	234,928	260,234	302,526	340,720
% of Total Expenses	23.0	25.3	27.6	28.6	29.0	28.7	29.7	29.6	30.0	29.3
Direct Maint.—Flight Equip.	$ 41,029	46,093	50,270	53,747	66,571	86,452	94,816	103,104	127,418	156,549
% of Total Expenses	11.0	11.2	11.6	11.6	12.0	12.8	12.0	11.7	12.6	13.5
Depreciation—Flight Equip.	$ 36,241	39,534	39,448	39,430	41,273	57,735	79,305	94,344	90,226	93,547
% of Total Expenses	9.7	9.6	9.1	8.5	7.5	8.6	10.0	10.7	8.9	8.0
Total Aircraft Oper. Expenses	$163,203	189,791	209,679	225,237	268,313	337,571	409,049	457,682	520,170	590,816
Local Service Airlines										
Flying Operations	$ 2,190	4,433	6,336	8,330	10,944	13,394	15,748	17,246	18,070	21,556
% of Total Expenses	24.3	28.5	29.0	30.8	30.5	30.8	30.9	32.5	31.8	31.6
Direct. Maint.—Flight Equip.	$ 1,332	2,289	3,198	3,433	4,284	5,451	6,479	5,950	6,709	8,235
% of Total Expenses	14.8	14.7	14.6	12.7	11.9	12.5	12.7	11.2	11.8	12.1
Depreciation—Flight Equip.	$ 908	1,375	1,938	1,492	1,613	2,098	2,443	1,893	1,818	2,148
% of Total Expenses	10.1	8.8	8.4	5.5	4.5	4.8	4.8	3.6	3.2	3.2
Total Aircraft Oper. Expenses	$ 4,430	8,097	11,472	13,255	16,841	20,943	24,670	25,089	26,597	31,939
Territorial Airlines										
Flying Operations	$ 704	946	1,091	1,221	1,468	1,623	1,875	1,908	1,942	2,032
% of Total Expenses	18.8	21.3	22.6	23.1	24.2	27.2	27.7	27.0	26.5	27.8
Direct Maint.—Flight Equip.	$ 537	603	551	543	644	580	625	713	715	716
% of Total Expenses	14.4	13.6	11.4	10.3	10.6	9.7	9.2	10.1	9.8	9.8
Depreciation—Flight Equip.	$ 259	330	331	359	253	143	392	482	488	320
% of Total Expenses	6.9	7.4	6.9	6.8	4.2	2.4	5.8	6.8	6.7	4.4
Total Aircraft Oper. Expenses	$ 1,500	1,879	1,973	2,123	2,365	2,346	2,892	3,103	3,145	3,068

[1] Preliminary data

DISTRIBUTION OF AIRCRAFT OPERATING EXPENSES *(continued)*

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Helicopter Airlines										
Flying Operations....$	13	94	151	205	135	264	540	583	613	707
% of Total Expenses....	25.0	27.2	29.6	28.0	18.7	25.1	22.8	22.1	20.7	19.1
Direct Maint.—Flight Equip....$	5	50	83	116	182	213	418	533	566	626
% of Total Expenses....	9.6	14.5	16.3	16.0	25.2	20.3	20.3	20.2	19.2	16.9
Depreciation—Flight Equip....$	14	81	105	123	76	128	456	391	405	549
% of Total Expenses....	26.9	23.4	20.6	16.8	10.5	12.2	19.3	14.8	13.7	14.8
Total Aircraft Oper. Expenses....$	32	225	339	444	393	605	1,477	1,507	1,584	1,882
International and Overseas Airlines										
Flying Operations....$	53,189	67,163	72,347	70,980	75,031	87,368	91,489	98,755	108,553	125,546
% of Total Expenses....	25.4	28.5	28.6	28.6	27.8	28.7	28.8	29.7	29.7	29.9
Direct Maint.—Flight Equip....$	21,997	24,241	26,311	26,158	29,856	33,043	32,808	30,811	34,632	44,696
% of Total Expenses....	10.5	10.3	10.4	10.5	11.1	10.9	10.3	9.3	9.5	10.7
Depreciation—Flight Equip....$	18,580	19,589	23,676	25,638	24,263	26,480	26,723	27,799	27,547	30,942
% of Total Expenses....	8.9	8.3	9.4	10.3	9.0	8.7	8.4	8.4	7.5	7.4
Total Aircraft Oper. Expenses....$	93,766	110,993	122,334	122,776	129,150	146,891	151,020	157,365	170,732	201,184
Alaskan Airlines										
Flying Operations....$	....	3,138	3,440	3,020	4,160	4,634	5,479	5,224	7,232	9,899
% of Total Expenses....	....	38.9	33.8	31.1	31.6	28.4	30.0	28.9	33.0	36.4
Direct Maint.—Flight Equip....$	....	923	1,342	1,591	2,257	2,744	2,673	2,580	3,083	3,610
% of Total Expenses....	....	11.4	13.2	16.4	17.2	16.8	14.7	14.3	15.0	13.3
Depreciation—Flight Equip....$	....	810	987	880	718	741	863	1,087	899	1,008
% of Total Expenses....	....	10.0	9.7	9.1	5.5	4.5	4.7	6.0	4.1	3.7
Total Aircraft Oper. Expenses....$	....	4,871	5,769	5,491	7,135	8,119	9,015	8,891	11,214	14,517
All Cargo Airlines[2]										
Flying Operations....$	....	....	966	4,633	6,361	6,752	8,062	7,834	10,632	15,997
% of Total Expenses....	....	....	42.3	42.9	44.4	42.4	42.2	39.6	40.4	40.2
Direct Maint.—Flight Equip....$	....	....	270	1,332	1,823	2,808	3,121	2,668	3,782	5,972
% of Total Expenses....	....	....	11.8	12.3	12.7	17.6	16.3	13.5	14.4	15.0
Depreciation—Flight Equip....$	....	....	54	246	356	495	836	1,930	1,834	2,793
% of Total Expenses....	....	....	2.4	2.3	2.5	3.1	4.4	9.8	7.0	7.0
Total Aircraft Oper. Expenses....$	....	....	1,290	6,211	8,540	10,055	12,019	12,432	16,248	24,762
Total Scheduled Airline Industry										
Flying Operations....$	142,029	179,938	204,292	220,449	258,568	307,419	358,121	391,784	449,568	516,457
% of Total Expenses....	23.9	26.7	28.1	28.9	29.0	29.0	29.7	29.9	30.2	29.9
Direct Maint.—Flight Equip....$	64,900	74,199	82,025	86,920	105,617	131,291	141,003	146,359	176,905	220,404
% of Total Expenses....	10.9	11.0	11.3	11.4	11.8	12.4	11.7	11.2	11.9	12.8
Depreciation—Flight Equip....$	56,002	61,719	66,539	68,168	68,552	87,820	111,018	127,926	123,217	131,307
% of Total Expenses....	9.4	9.1	9.1	8.9	7.7	8.3	9.2	9.7	8.3	7.6
Total Aircraft Oper. Expenses....$	262,931	315,856	352,856	375,537	432,737	526,530	610,142	666,069	749,690	868,168

[1] Preliminary data.

[2] Seaboard and Western data not included in 1956.

DISTRIBUTION OF GROUND AND INDIRECT EXPENSES

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Domestic Trunk Airlines										
Ground Operations	$ 59,464	64,915	66,623	68,541	79,265	94,606	107,044	119,207	133,231	152,884
Ground and Indirect Maintenance	$ 32,812	33,515	33,404	33,653	41,110	50,856	56,940	61,331	68,736	82,760
Passenger Service	$ 28,669	29,151	27,778	30,870	42,563	47,045	53,115	58,235	72,978	83,938
Traffic and Sales	$ 42,644	42,668	45,661	48,079	58,024	70,253	81,472	89,288	103,882	124,507
Advertising and Publicity	$ 9,486	12,343	13,533	14,566	16,211	18,880	22,027	24,861	30,809	34,807
General and Administrative	$ 31,052	31,217	30,894	33,651	40,816	46,874	52,259	57,744	68,827	79,646
Depreciation—Ground Equipment	$ 6,060	7,678	7,585	6,941	6,279	6,807	8,515	10,411	11,430	12,737
Total—Ground and Indirect Expenses	$210,187	221,487	225,478	236,301	284,268	335,321	381,372	421,077	489,893	571,279
Local Service Airlines										
Ground Operations	$ 1,650	2,682	3,743	4,969	6,229	7,254	8,406	8,753	9,511	11,168
Ground and Indirect Maintenance	$ 740	1,114	1,339	1,823	2,496	3,150	3,596	3,666	3,756	4,328
Passenger Service	$ 261	540	825	1,090	1,671	1,944	2,218	2,389	2,684	3,383
Traffic and Sales	$ 660	1,053	1,771	2,434	3,943	4,868	6,099	6,895	7,618	9,465
Advertising and Publicity	$ 251	386	634	807	1,072	1,172	1,340	1,449	1,656	1,918
General and Administrative	$ 902	1,436	1,792	2,484	3,301	3,682	4,028	4,330	4,463	5,358
Depreciation—Ground Equipment	$ 123	270	295	344	440	484	546	535	554	629
Total—Ground and Indirect Expenses	$ 4,587	7,481	10,399	13,951	19,152	22,554	26,233	28,017	30,242	36,249
Territorial Airlines										
Ground Operations	$ 767	904	922	906	1,040	1,001	1,212	1,269	1,258	1,317
Ground and Indirect Maintenance	$ 342	357	349	399	433	384	482	532	562	541
Passenger Service	$ 97	140	165	190	223	213	210	198	245	252
Traffic and Sales	$ 385	441	528	681	858	881	768	769	842	958
Advertising and Publicity	$ 50	42	100	151	172	167	143	140	204	226
General and Administrative	$ 502	567	682	743	887	899	953	955	963	847
Depreciation—Ground Equipment	$ 96	103	113	93	89	81	97	114	116	97
Total—Ground and Indirect Expenses	$ 2,239	2,554	2,859	3,163	3,702	3,626	3,865	3,977	4,190	4,238
Helicopter Airlines										
Ground Operations	$ 3	33	50	98	108	138	283	334	425	543
Ground and Indirect Maintenance	$ 6	39	50	66	89	124	217	275	305	360
Passenger Service	$	.....	.....	.....	.....	.....	11	15	22	22
Traffic and Sales	$	.....	.....	.....	.....	.....	26	75	141	269
Advertising and Publicity	$	2	2	2	1	3	17	32	40	43
General and Administrative	$ 9	43	63	112	119	164	306	365	393	499
Depreciation—Ground Equipment	$ 2	4	6	10	11	16	30	35	45	84
Total—Ground and Indirect Expenses	$ 20	121	171	288	328	445	890	1,131	1,371	1,820
International and Overseas Airlines										
Ground Operations	$ 30,460	31,005	33,168	31,618	34,916	39,726	42,189	43,397	47,050	51,468
Ground and Indirect Maintenance	$ 17,805	20,219	20,934	17,282	20,014	21,188	22,219	22,302	24,236	27,354
Passenger Service	$ 13,084	14,034	14,617	14,589	17,511	19,554	20,027	22,372	26,716	31,050
Traffic and Sales	$ 21,996	25,350	25,560	25,886	29,821	34,945	37,727	40,573	45,872	53,163
Advertising and Publicity	$ 6,745	7,861	10,171	10,628	11,374	12,541	13,692	14,273	16,095	17,679
General and Administrative	$ 22,722	22,887	22,600	22,170	23,903	26,754	27,931	28,970	31,377	33,824
Depreciation—Ground Equipment	$ 2,716	2,938	3,479	3,374	3,041	2,668	3,102	3,434	3,526	3,696
Total—Ground and Indirect Expenses	$115,528	124,294	130,529	125,547	140,580	157,376	166,887	175,321	194,872	218,234

[1] Preliminary data

DISTRIBUTION OF GROUND AND INDIRECT EXPENSES *(continued)*

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Alaskan Airlines										
Ground Operations	.....	845	988	966	1,411	2,182	2,449	2,612	4,224	5,389
Ground and Indirect Maintenance	.....	525	1,001	774	1,429	1,923	1,919	1,997	2,010	2,256
Passenger Service	.....	268	370	358	501	694	797	696	771	962
Traffic & Sales	.....	435	598	499	699	1,170	1,364	1,384	1,321	1,514
Advertising and Publicity	.....	102	116	135	175	209	297	265	275	321
General and Administrative	.....	903	1,180	1,332	1,591	1,767	2,100	1,952	1,582	1,872
Depreciation—Ground Equip.	.....	121	156	148	204	264	302	308	310	359
Total—Ground & Indirect Expenses	.....	3,199	4,409	4,212	6,010	8,209	9,228	9,214	10,493	12,673
All Cargo Airlines[2]										
Ground Operations	.....	.....	206	1,033	982	2,383	2,844	2,812	3,895	6,228
Ground and Indirect Maintenance	.....	.....	97	437	747	875	800	1,138	1,503	2,335
Passenger Service	.....	.....	.....	.....	1	.....	23	209	269	630
Traffic and Sales	.....	.....	445	1,939	2,886	1,004	1,233	945	1,788	2,565
Advertising and Publicity	.....	.....	8	40	107	309	249	70	288	428
General and Administrative	.....	.....	215	1,047	1,007	1,182	1,760	1,969	2,103	2,490
Depreciation—Ground Equip.	.....	.....	20	83	71	109	163	198	239	340
Total—Ground & Indirect Expenses	.....	.....	991	4,579	5,801	5,862	7,072	7,341	10,085	15,016
Total Scheduled Airline Industry										
Ground Operations	$ 92,344	100,384	105,700	108,131	123,951	147,290	164,427	178,384	199,594	228,997
Ground and Indirect Maintenance	$ 51,705	55,769	57,174	54,434	66,318	78,500	86,173	91,241	101,108	119,934
Passenger Service	$ 42,111	44,133	43,755	47,097	62,470	69,450	76,401	84,114	103,685	120,237
Traffic and Sales	$ 65,685	69,947	74,563	79,518	96,231	113,121	128,689	139,929	161,464	192,441
Advertising and Publicity	$ 16,532	20,736	24,564	26,329	29,112	33,281	37,765	41,090	49,367	55,422
General and Administrative	$ 55,187	57,053	57,426	61,539	71,624	81,322	89,337	96,284	109,708	124,536
Depreciation—Ground Equip.	$ 8,997	11,114	11,654	10,993	10,135	10,429	12,755	15,035	16,220	17,942
Total—Ground & Indirect Expenses	$332,561	359,136	374,836	388,041	459,841	533,393	595,547	646,077	741,146	859,509

[2] Seaboard and Western data not included in 1956.

SUMMARY OF PROFIT OR LOSS

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[3]
Domestic Trunk Airlines										
Total Operating Revenues	$ 352,490	413,353	459,783	524,109	658,521	768,015	878,793	978,218	1,133,348	1,262,758
Total Operating Expenses	$ 373,390	411,278	435,157	461,538	552,581	672,892	790,421	878,759	1,010,063	1,162,095
Net Operating Income	$ (20,900)	2,075	24,626	62,571	105,940	95,123	88,372	99,458	123,285	100,663
Net Income Before Taxes[1]	$ (26,258)	(1,413)	20,663	59,305	103,355	102,814	96,008	102,161	133,075	114,832
Income Taxes	$ (6,016)	3,583	7,285	28,426	59,858	49,280	47,624	50,671	70,062	57,408
Net Profit or Loss	$ (20,242)	(4,996)	13,378	30,879	43,497	53,534	48,384	51,490	63,013	57,424

[1] Net income before taxes is adjusted for nonoperating items.
( ) Denotes red figures.
[3] Preliminary data.

SUMMARY OF PROFIT OR LOSS *(continued)*

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[2]
Local Service Airlines										
Total Operating Revenues	$ 8,411	15,921	21,418	27,683	36,741	42,379	49,358	54,473	57,236	67,380
Total Operating Expenses	$ 9,017	15,578	21,871	27,206	35,993	43,497	50,903	53,105	56,839	68,188
Net Operating Income	$ (606)	343	(453)	477	802	(1,118)	(1,545)	1,368	397	(808)
Net Income Before Income Taxes[1]	$ (1,182)	(486)	(1,283)	(176)	601	(345)	(2,080)	1,212	637	(962)
Income Taxes	$ (77)	94	168	399	399	141	(47)	254	481	39
Net Profit or Loss	$ (1,105)	(580)	(1,451)	(575)	202	(486)	(2,033)	958	157	(923)
Territorial Airlines										
Total Operating Revenues	$ 3,901	4,650	4,778	5,213	6,212	6,246	6,726	6,788	7,114	7,430
Total Operating Expenses	$ 3,739	4,433	4,832	5,286	6,067	5,972	6,757	7,080	7,335	7,306
Net Operating Income	$ 162	217	(54)	(73)	145	274	(31)	(292)	(221)	124
Net Income Before Income Taxes[1]	$ 124	167	(132)	(135)	125	254	(10)	(454)	(117)	14
Income Taxes	$ 35	65	57	3	77	88	(51)	(27)	8	.....
Net Profit or Loss	$ 89	102	(189)	(138)	48	166	41	(427)	(125)	14
Helicopter Airlines										
Total Operating Revenues	$ 37	372	522	798	892	1,046	2,605	3,069	3,351	3,422
Total Operating Expenses	$ 52	346	510	732	721	1,050	2,367	2,638	2,955	3,702
Net Operating Income	$ (15)	26	12	66	171	(4)	238	431	396	(280)
Net Income Before Income Taxes[1]	$ (22)	(4)	(16)	36	138	(50)	168	353	543	(345)
Income Taxes	$	.....	.....	8	42	30	68	163	201	(1)
Net Profit or Loss	$ (22)	(4)	(16)	28	96	(80)	100	190	342	(344)
International & Overseas Airlines										
Total Operating Revenues	$ 209,010	249,234	274,155	260,131	287,799	314,918	337,286	358,856	384,302	452,757
Total Operating Expenses	$ 209,294	235,287	252,863	248,323	269,730	304,267	317,907	322,686	365,604	419,418
Net Operating Income	$ (284)	13,947	21,292	11,808	18,069	10,651	19,379	26,170	18,698	33,339
Net Income Before Income Taxes[1]	$ (4,473)	8,780	8,816	13,631	18,801	14,380	23,393	29,723	23,581	38,158
Income Taxes	$ 651	2,415	1,362	3,623	7,063	6,651	10,865	13,047	10,355	17,847
Net Profit or Loss	$ (5,124)	6,365	7,454	10,008	11,738	7,729	12,528	16,676	13,226	20,311
Alaskan Airlines										
Total operating Revenues	$	8,349	8,496	9,438	12,142	15,961	19,300	19,206	22,329	29,339
Total Operating Expenses	$	8,070	10,178	9,703	13,145	16,328	18,243	18,105	21,707	27,190
Net Operating Income	$	279	(1,682)	(265)	(1,003)	(367)	1,057	1,099	617	2,149
Net Income Before Income Taxes[1]	$	171	(1,817)	(396)	(1,196)	(78)	873	1,126	828	1,957
Income Taxes	$	26	15	37	24	373	113	232	259	896
Net Profit or Loss	$	145	(1,832)	(433)	(1,220)	(451)	760	894	569	1,061

[1] Net income before taxes is adjusted for nonoperating items.

( ) Denotes red figures.

[2] Preliminary data.

SUMMARY OF PROFIT OR LOSS *(continued)*

U. S. Scheduled Airlines, *1947-1956 (in thousands of dollars)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[2]
All Cargo Airlines[3]										
Total Operating Revenues $	.....	.....	2,110	12,361	17,365	17,047	19,216	16,959	27,027	38,090
Total Operating Expenses $	.....	.....	2,281	10,790	14,341	15,917	19,091	19,773	26,333	39,778
Net Operating Income $	.....	.....	(171)	1,571	3,024	1,130	125	(2,814)	694	(1,688)
Net Income Before Income Taxes[1] $	.....	.....	(153)	1,779	3,735	2,399	3,626	(3,404)	1,260	2,189
Income Taxes $	.....	.....	2	575	2,050	709	1,357	(1,624)	20	951
Net Profit or Loss $	.....	.....	(155)	1,204	1,685	1,690	2,269	(1,780)	1,240	1,238
Total Scheduled Airline Industry										
Total Operating Revenues $	573,849	697,879	771,262	839,920	1,019,672	1,165,612	1,313,284	1,437,805	1,634,707	1,861,175
Total Operating Expenses $	595,492	674,992	727,692	763,578	892,578	1,059,923	1,205,689	1,312,146	1,490,836	1,727,677
Net Operating Income $	(21,643)	16,887	43,570	76,342	127,094	105,689	107,595	125,659	143,877	133,498
Net Income Before Income Taxes[1] $	(31,811)	7,215	26,078	74,044	125,559	119,374	121,978	130,717	159,807	155,842
Income Taxes $	(5,407)	6,183	8,889	33,071	69,513	57,272	59,929	62,716	81,385	77,062
Net Profit or Loss $	(26,404)	1,032	17,189	40,973	56,046	62,102	62,049	68,001	78,422	78,780

[1] Net income before taxes is adjusted for nonoperating items.
( ) Denotes red figures.
[2] Preliminary data.
[3] Seaboard and Western data not included in 1956.

ASSETS, LIABILITIES AND CAPITAL

U. S. Scheduled Airlines, *for selected years (in thousands of dollars)*

	1948	1950	1952	1954	1956[1]
Domestic Trunk Airlines					
Assets					
Current Assets	$171,860	203,952	344,115	358,375	406,956
Flight Equipment	$299,261	374,803	567,787	782,816	1,026,730
— Depreciation	$110,910	173,183	258,431	394,292	533,100
Flight Equipment—Net	$188,351	201,620	309,356	388,524	493,630
Ground Property and Equipment—Net	$ 73,722	59,265	76,506	90,371	121,972
Property and Equipment—Net	$262,073	260,885	385,862	478,895	615,602
Deferred Charges	$ 16,497	16,361	8,194	9,211	12,302
Other Assets	$ 33,811	61,341	37,593	38,035	126,493
Total Assets	$484,241	542,539	775,764	884,516	1,161,353
Liabilities and Capital					
Current Liabilities	$ 99,837	130,107	231,760	241,942	292,112
Long Term Debt	$167,404	135,842	168,247	185,093	262,956
Operating Reserves	$ 2,387	3,971	4,169	5,796	10,760
Capital Stock	$121,313	123,469	145,135	139,360	108,300
Capital Surplus	$ 60,573	64,644	89,028	91,845	165,144
Earned Surplus	$ 13,943	67,179	133,532	207,947	290,374
Other Liabilities	$ 18,784	17,327	3,893	12,533	31,707
Total Liabilities and Capital	$484,241	542,539	775,764	884,516	1,161,353

[1] Data for 1956 are as of Sept. 30th.

ASSETS, LIABILITIES AND CAPITAL *(continued)*

U. S. Scheduled Airlines, *for selected years (in thousands of dollars)*

	1948	1950	1952	1954	1956[1]
Local Service Airlines					
Assets					
Current Assets	$ 5,279	7,577	10,359	11,927	13,769
Flight Equipment	$ 5,671	10,056	16,404	17,693	25,806
— Depreciation	$ 2,396	5,020	6,788	9,873	12,384
Flight Equipment—Net	$ 3,275	5,036	9,616	7,820	13,422
Ground Property and Equipment—Net	$ 2,016	1,882	3,722	2,735	4,844
Property and Equipment—Net	$ 5,291	6,918	13,338	10,555	18,266
Deferred Charges	$ 1,349	1,743	1,209	1,018	1,161
Other Assets	$ 819	521	917	573	1,407
Total Assets	$ 12,738	16,759	25,823	24,073	34,603
Liabilities and Capital					
Current Liabilities	$ 3,333	6,542	10,346	10,666	16,446
Long Term Debt	$ 1,590	1,485	3,575	1,931	6,060
Operating Reserves	$ 105	287	357	616	1,119
Capital Stock	$ 4,832	6,938	7,218	6,720	6,799
Capital Surplus	$ 4,454	4,193	5,633	4,654	4,912
Earned Surplus	$ (1,665)	(2,815)	(1,821)	(556)	(889)
Other Liabilities	$ 89	129	515	42	156
Total Liabilities and Capital	$ 12,738	16,759	25,823	24,073	34,603
Territorial Airlines					
Assets					
Current Assets	$ 1,333	1,649	1,900	1,577	1,246
Flight Equipment	$ 2,411	2,300	4,338	6,354	5,994
— Depreciation	$ 1,261	1,653	2,277	2,899	3,046
Flight Equipment—Net	$ 1,150	647	2,061	3,455	2,948
Ground Property and Equipment—Net	$ 530	487	887	630	457
Property and Equipment—Net	$ 1,680	1,134	2,948	4,085	3,405
Deferred Charges	$ 85	72	268	161	151
Other Assets	$ 65	227	526	9	14
Total Assets	$ 3,163	3,082	5,642	5,832	4,816
Liabilities and Capital					
Current Liabilities	$ 486	466	1,601	1,751	1,444
Long Term Debt	$ 4	.....	1,222	1,725	1,741
Operating Reserves	$ 62	47	79	84	54
Capital Stock	$ 1,845	1,845	2,775	2,776	1,981
Capital Surplus	$ 372	372	372	386	832
Earned Surplus	$ 305	278	(419)	(895)	(1,237)
Other Liabilities	$ 89	74	12	5	1
Total Liabilities and Capital	$ 3,163	3,082	5,642	5,832	4,816
Helicopter Airlines					
Assets					
Current Assets	$ 63	302	900	2,659	1,757
Flight Equipment	$ 297	528	1,371	2,285	3,845
— Depreciation	$ 94	285	385	1,176	1,646
Flight Equipment—Net	$ 203	243	986	1,109	2,199
Ground Property and Equipment—Net	$ 10	32	105	158	315
Property and Equipment—Net	$ 213	275	1,091	1,267	2,514
Deferred Charges	$ 89	71	263	145	169
Other Assets	$ 1	84	113	42	378
Total Assets	$ 366	732	2,367	4,113	4,818
Liabilities and Capital					
Current Liabilities	$ 97	69	430	656	481
Long Term Debt	$	.....	138	204	711
Operating Reserves	$	.....	4	33	50
Capital Stock	$ 294	695	816	899	677
Capital Surplus	$	.....	974	1,998	2,201
Earned Surplus	$ (25)	(32)	5	309	698
Other Liabilities	$	.....	.....	14	.....
Total Liabilities and Capital	$ 366	732	2,367	4,113	4,818

[1] Data for 1956 are as of Sept. 30th.

( ) Denotes red figures.

U. S. Scheduled Airlines, *for selected years (in thousands of dollars)*

	1948	1950	1952	1954	1956[1]
International and Overseas Airlines					
Assets					
Current Assets	$ 71,748	93,957	79,437	99,695	108,420
Flight Equipment	$ 94,782	133,489	164,524	193,798	256,410
— Depreciation	$ 32,398	55,495	76,243	91,061	110,371
Flight Equipment—Net	$ 62,384	77,994	88,281	102,737	146,039
Ground Property and Equipment—Net	$ 15,030	12,231	12,775	13,380	15,941
Property and Equipment—Net	$ 77,414	90,225	101,056	116,177	161,980
Deferred Charges	$ 24,909	25,688	20,706	4,685	4,541
Other Assets	$ 30,403	9,190	16,554	21,273	38,746
Total Assets	$204,474	219,070	217,753	241,770	313,687
Liabilities and Capital					
Current Liabilities	$ 31,477	52,623	66,986	81,341	92,356
Long Term Debt	$ 5,800	41,250	27,955	29,575	72,379
Operating Reserves	$ 5,438	5,776	6,314	3,637	4,136
Capital Stock	$ 7,665	10,766	10,895	13,068	13,777
Capital Surplus	$ 30,518	62,828	62,828	62,880	63,338
Earned Surplus	$ 18,691	26,024	33,584	47,184	60,690
Other Liabilities	$104,885	19,803	9,191	4,085	7,011
Total Liabilities and Capital	$204,474	219,070	217,753	241,770	313,687
Alaskan Airlines					
Assets					
Current Assets	$ 3,203	2,800	4,141	4,591	7,897
Flight Equipment	$ 4,146	4,629	5,856	8,251	11,186
— Depreciation	$ 1,743	3,125	4,026	5,307	5,390
Flight Equipment—Net	$ 2,403	1,504	1,830	2,944	5,796
Ground Property and Equipment—Net	$ 1,197	1,125	2,212	2,225	2,700
Property and Equipment—Net	$ 3,600	2,629	4,042	5,169	8,496
Deferred Charges	$ 177	130	230	172	254
Other Assets	$ 262	281	255	347	532
Total Assets	$ 7,242	5,840	8,668	10,279	17,179
Liabilities and Capital					
Current Liabilities	$ 2,685	2,571	4,878	3,449	6,255
Long Term Debt	$ 408	475	1,634	1,419	3,581
Operating Reserves	$ 175	313	388	342	777
Capital Stock	$ 1,746	1,833	2,258	2,680	2,932
Capital Surplus	$ 3,256	3,248	3,121	3,800	3,610
Earned Surplus	$ (1,073)	(2,626)	(3,648)	(1,593)	(103
Other Liabilities	$ 45	26	37	182	127
Total Liabilities and Capital	$ 7,242	5,840	8,668	10,279	17,179
All Cargo Airlines					
Assets					
Current Assets	.....	$5,822	9,072	8,138	21,125
Flight Equipment	.....	$2,631	8,661	20,921	31,003
— Depreciation	.....	$ 838	2,264	6,212	9,459
Flight Equipment—Net	.....	$1,793	6,397	14,709	21,544
Ground Property and Equipment—Net	.....	$ 508	1,468	1,356	2,376
Property and Equipment—Net	.....	$2,301	7,865	16,065	23,920
Deferred Charges	.....	$ 422	395	335	1,543
Other Assets	.....	$ 381	3,016	281	20,292
Total Assets	.....	$8,926	20,348	24,819	66,880
Liabilities and Capital					
Current Liabilities	.....	$3,682	7,320	6,103	16,895
Long Term Debt	.....	$1,531	3,443	7,345	16,887
Operating Reserves	.....	$ 321	386	1,598	2,081
Capital Stock	.....	$4,183	6,360	6,401	10,382
Capital Surplus	.....	$3,135	1,732	2,352	11,992
Earned Surplus	.....	$3,971	981	968	7,183
Other Liabilities	.....	$ 45	126	52	1,460
Total Liabilities and Capital	.....	$8,926	20,348	24,819	66,880

[1] Data for 1956 are as of Sept. 30th.

ASSETS, LIABILITIES AND CAPITAL *(continued)*

U. S. Scheduled Airlines, *for selected years (in thousands of dollars)*

	1948	1950	1952	1954	1956[1]
Consolidated Industry					
Assets					
Current Assets	$ 253,486	316,069	449,924	486,962	561,170
Flight Equipment	$ 406,568	528,436	768,941	1,032,118	1,360,974
— Depreciation	$ 148,802	239,599	350,414	510,820	675,396
Flight Equipment—Net	$ 257,766	288,837	418,527	521,298	685,578
Ground Property and Equipment—Net	$ 92,505	75,530	97,675	110,885	148,605
Property and Equipment—Net	$ 350,271	364,367	516,202	632,153	834,183
Deferred Charges	$ 43,106	44,487	31,265	15,727	20,121
Other Assets	$ 65,361	72,025	58,974	60,560	187,862
Total Assets	$ 712,224	796,948	1,056,365	1,195,402	1,603,336
Liabilties and Capital					
Current Liabilities	$ 137,915	196,060	323,321	345,908	425,989
Long Term Debt	$ 175,206	180,583	206,214	227,292	364,315
Operating Reserves	$ 8,167	10,715	11,697	12,106	18,977
Capital Stock	$ 137,695	149,729	175,457	171,904	144,848
Capital Surplus	$ 99,173	138,420	163,688	167,915	252,029
Earned Surplus	$ 30,176	84,037	162,214	253,364	356,716
Other Liabilities	$ 123,892	37,404	13,774	16,913	40,462
Total Liabilities and Capital	$ 712,224	796,948	1,056,365	1,195,402	1,603,336

[1] Data for 1956 are as of Sept. 30th.

INTERCITY PASSENGER MILE MARKET

Common Carriers and Private Automobile, *1947-1956*

(Millions of Passenger Miles)

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Pullman & Air Travel										
Rail Pullman (Class I)	12,261	11,015	9,349	9,338	10,226	9,504	7,950	6,850	6,441	6,319
Domestic Trunk Lines	6,016	5,822	6,571	7,766	10,211	12,121	14,298	16,246	19,218	21,643
Local Service Airlines	46	88	135	189	290	340	391	450	523	633
Pullman and Air Combined	18,323	16,925	16,055	17,293	20,727	21,965	22,639	23,546	26,182	28,595
Airline % of Combined Total	33.08	34.92	41.77	46.00	50.66	56.73	64.88	70.91	75.40	77.90
Other Common Carriers										
Rail Coach (Class I, ex. commutation)	27,660	24,315	20,273	17,443	19,524	19,758	18,955	17,687	17,314	17,054
Intercity Motor Bus Lines (Class I, II, III)	23,948	23,529	22,411	21,254	22,299	21,223	19,634	16,934	16,489	16,448
Total	51,608	47,844	42,684	38,697	41,823	40,981	38,589	34,621	33,803	33,502
Total Common Carrier	69,931	64,769	58,739	55,990	62,550	62,946	61,228	58,167	59,985	62,097
% Airline of Common Carrier	8.67	9.12	11.42	14.21	16.79	19.80	23.99	28.70	32.91	35.87
Private Intercity Automobile[2]	272,958	287,423	376,313	402,843	457,787	495,547	529,194	548,763	585,800	621,000
Total Common and Private Carrier	342,889	352,192	435,052	458,833	520,337	558,493	590,422	606,930	645,785	683,097
Passenger Miles per Capita[3]	2,381	2,403	2,916	3,025	3,371	3,557	3,699	3,737	3,907	4,064

[1] Partly Estimated
[2] Revised from 1949
[3] Not in Millions

REVENUE PASSENGERS CARRIED

U. S. Scheduled Airline Industry, *1947-1956 (in Thousands of Passengers)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Domestic Trunk Airlines	12,279	12,324	14,021	15,978	20,621	22,759	26,137	29,526	34,511	37,598
Local Service Airlines	236	426	678	969	1,481	1,736	2,032	2,423	2,897	3,453
Territorial Airlines	376	418	382	477	550	515	553	561	591	627
Helicopter Airlines	.....	.....	.....	.....	.....	.....	1	9	29	62
International and Overseas Airlines	1,360	1,373	1,520	1,675	2,033	2,362	2,682	2,888	3,376	3,888
Alaskan Airlines[1]	.....	111	122	144	157	194	220	225	264	315
Total Scheduled Airline Industry	14,251	14,652	16,723	19,243	24,842	27,566	31,625	35,632	41,623	45,943

[1] Alaskan data for 1948 thru 1950 includes charter flights

AVERAGE PASSENGER FARE

Intercity Common Carriers, *1947-1956 (in Cents per Mile)*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[2]
Domestic Scheduled Airlines[1]										
Coach or Tourist	.....	.....	3.96	4.10	4.45	4.18	4.13	4.34	4.32	4.31[3]
All Services	5.04	5.75	5.75	5.54	5.59	5.54	5.43	5.37	5.32	5.30
Int'l Scheduled Airlines										
Coach or Tourist	.....	.....	.....	.....	.....	.....	5.77	5.83	n.a.	n.a.
All Services	7.77	8.01	7.72	7.28	7.13	7.05	6.87	6.79	6.69	6.70
Intercity Railroads										
First Class	2.74	3.01	3.14	3.25	3.27	3.35	3.38	3.35	3.31	3.38
Coach	2.02	2.29	2.41	2.47	2.47	2.53	2.53	2.50	2.47	2.55
Intercity Motor Busses	1.70	1.74	1.84	1.88	1.94	2.02	2.05	2.07	2.06	2.07

[1] Includes trunk, local service and territorial airlines.
[2] Partly estimated.
[3] Fiscal 1956.
n.a.—Not available.

NEW TYPES OF AIRCRAFT IN SCHEDULED SERVICE

U. S. Domestic and International Airlines—*Operated as of December 31, 1956 and Cumulative Inventory Including Aircraft on Order through 1961*

Aircraft Type	Number In Service 12/31/56	1957	1958	1961
Boeing: 707*	.....	.....	.....	70
Bristol: Britannia*	.....	.....	5	5
Convair: 440	19	43	43	43
880*	.....	.....	.....	40
deHavilland: Comet IV*	.....	.....	6	14
Douglas: DC-6A, B & C	186	253	270	270
DC-7, B & C	132	211	253	253
DC-8*	.....	.....	.....	89
Fairchild: Friendship*	.....	16	31	31
Frye: Safari	.....	6	8	8
Lockheed: Constellation, G & H	32	51	51	51
L-1649	.....	25	25	25
Electra*	.....	.....	27	116
Vickers: Viscount*	54	74	89	92

* Jet Powered.

AIRCRAFT OPERATED

by U. S. Scheduled Airline Industry *as of December 31, for Selected Years*

Aircraft Type	Aircraft Used Wholly in Domestic Operations[1]				Aircraft Used Wholly in International and Overseas Oper.				Aircraft Used in Both Domestic and International Operations[2]			
	1946	1952	1954	1956	1946	1952	1954	1956	1946	1952	1954	1956
Boeing: 247-D	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
307-B	5	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
377	.....	.....	11	.....	.....	28	27	25	.....	16	10	9
Convair: 240	.....	22	16	22	.....	14	10	5	.....	77	76	73
340	.....	7	84	86	.....	1	5	5	.....	.....	32	32
440	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	11
Douglas: DC-3	460	343	259	282	78	56	56	50	.....	20	24	24
DC-4	150	80	71	61	42	50	39	48	8	55	45	34
DC-6/6A/6B	.....	65	72	99	.....	32	62	70	.....	98	117	130
DC-7/7B	.....	.....	20	4	.....	.....	.....	33	.....	.....	41	95
Lockheed:												
Electra	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lodestar	11	11	.....	.....	.....	.....	.....	.....	.....	.....	11	10
Constellation	4	51	53	52	23	14	9	9	8	50	49	56
Super Const.	.....	10	10	33	.....	.....	.....	2	.....	14	29	44
Martin: 202	.....	21	25	23	.....	.....	.....	.....	.....	.....	.....	.....
404	.....	96	100	97	.....	.....	.....	.....	.....	.....	.....	.....
Vickers Viscount	.....	.....	.....	54	.....	.....	.....	.....	.....	.....	.....	.....
Total	647[3]	706	711	821	146	195	208	247	16	330	434	518
Helicopters:												
Bell: B-47	.....	6	6	7								
Sikorsky: S-51	.....	3	3	2								
S-55	.....	5	11	8								
S-58	.....	.....	.....	3								
Total	.....	14	20	20								

[1] Includes Domestic Trunk and Local Service Carriers.
[2] Trunk Airlines who operate both Domestic and International Routes usually have their aircraft certificated for both operations in order to use these aircraft internationally.
[3] Total Domestic for 1946 includes 10 Stinsons.

AIRCRAFT OPERATIONS AT CAA AIRPORT TOWERS

1947-1956 (in Thousands)

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956[1]
Type of Flight Operation										
Military	1,595	2,259	2,780	2,384	2,852	2,983	3,712	4,409	4,975	5,075
Civil	13,221	12,877	10,446	9,585	9,618	7,965	7,719	8,015	8,540	9,107
Air Carrier	2,854	3,242	3,713	4,002	4,556	4,866	5,384	5,512	5,983	6,202
Total	17,670	18,378	16,939	15,971	17,026	15,814	16,815	17,945	19,480	20,384
% Air Carrier of Total	16.2	17.6	21.9	25.1	26.8	30.8	32.0	30.8	30.7	30.4

NOTES: Air Carriers include scheduled and non scheduled operations.
Each landing is counted as an operation as is also each takeoff.
[1] Fiscal Year.

COMPARATIVE TRANSPORT SAFETY RECORD

Passenger Fatality Rate *per 100,000,000 Passenger Miles, 1947-1956*

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Domestic Scheduled Airlines										
Fatalities	199	83	93	96	142	46	86	16	156	144
Rate	3.28	1.40	1.39	1.21	1.35	.37	.59	.10	.79	.64
International and Overseas Scheduled Airlines[1]										
Fatalities	20	20	4	48	43	94	2	0	2	10
Rate	1.08	1.02	.19	2.10	1.59	2.98	.06	.....	.04	.19
Motor Buses										
Fatalities	140	120	120	100	130	100	70	60	100	n.a.
Rate	.21	.18	.20	.17	.22	.16	.13	.11	.19	n.a.
Railroad Passenger Trains										
Fatalities	75	52	29	184	150	14	50	23	19	52 p.
Rate	.16	.13	.08	.58	.43	.04	.16	.08	.07	.19 p.
Passenger Autos and Taxis										
Fatalities	15,300	15,200	15,300	17,600	21,000	22,600	23,500	22,500	24,700	n.a.
Rate	2.3	2.1	2.0	2.2	2.4	2.8	2.9	2.6	2.7	n.a.

[1] Alaska data not included for 1947.
n.a.—Not Available.
p.—Preliminary.

CLASSES OF UNITED STATES COMMERCIAL AIR CARRIERS

At the present time there are seven recognized classes of air carriers in the air transport industry of the United States. This classification is used by the Civil Aeronautics Board in connection with the economic regulation of the industry and under the Civil Aeronautics Act is based largely on the scope of operations authorized or allowed by that Act. Classes One to Six have certificates of convenience and necessity and conduct regularly scheduled services.

1. **The Domestic Trunk Lines** include those air carriers which presently have permanent operating rights within the continental United States. These rights derive largely from operations by present or predecessor companies antedating the Civil Aeronautics Act of 1938 which granted them "grandfather rights." There are currently twelve trunk lines, most of which operate high-density traffic routes between the principal traffic centers of the United States.

American	Continental	National	Trans World
Braniff	Delta	Northeast	United
Capital	Eastern	Northwest	Western

2. **The Domestic Local Service Lines** have, with one exception, been certificated since 1945. These carriers operate routes of lesser traffic density between the smaller traffic centers and between these centers and principal centers. The thirteen local service lines in 1955 were:

Allegheny	Lake Central	Ozark	Southwest
Bonanza	Mohawk	Piedmont	Trans Texas
Central	North Central	Southern	West Coast
Frontier			

3. **The International and Overseas Lines** include all U. S. flag air carriers operating between the United States and foreign countries other than Canada. Some of these carriers conduct operations between foreign countries and some are extensions of domestic trunk lines into Mexico and the Caribbean.

Alaska	Eastern	Pacific Northern	South Pacific [2]
American	Mackey [2]	Pan American	Trans World
Braniff	National	Pan American-Grace	U. M. C. A. [2]
Caribbean Atlantic	Northwest	Resort [1]	United
Delta		Samoan [2]	

4. **The Territorial Lines** include two groups of carriers. The Insular Lines operate in the U. S. Island possessions in the Pacific and the Caribbean and the Alaskan Lines operate between the U. S. and Alaska and within Alaska.

Insular Lines	Alaskan Lines			
	Operating between the U. S. and Alaska		Operators within Alaska	
Hawaiian	Alaska	Pacific Northern	Alaska	Howard J. Mays
Trans-Pacific	Northwest	Pan American	Alaska Coastal	Northern Consolidated
			Bristol Bay	Pacific Northern
			Cordova	Pan American
			Ellis	Reeve Aleutian
				Wien

5. **The Helicopter Airmail Lines** presently operate between airports, central post offices, and suburbs in New York, Chicago and Los Angeles. Originally certificated as exclusive mail carriers they now fly passengers, air freight and air express. These carriers hold temporary certificates and are considered to be experimental in nature.

Chicago Helicopter Airways	Los Angeles Airways	New York Airways

6. **The All Cargo Lines** operate under temporary certificates authorizing scheduled cargo flights between designated areas in the U. S., and in one case to the Caribbean and in another to Europe. These carriers cannot carry either regular air mail or passengers.

Aerovias Sud Americana	Flying Tigers	Seaboard & Western
American Air Export and Import	Riddle	Slick

7. **Non-Certificated Air Carriers** include a diversified group of operators who, with the exception of the air taxi operators and air freight forwarders, are not authorized to engage in regularly scheduled service. They are described in the CAB 1954 Annual Report as follows:

Operators of various types of air services have been authorized by the Board through the exemption process, rather than through the requirement that a certificate of convenience and necessity be obtained. At present this group includes:

Supplemental and irregular transport carriers	49
Air freight forwarders	80

[1] Certificated cruise carrier.
[2] Certificated non-mail carriers.
[1, 2] Statistical data of these carriers are not included in the statistical tables.

AIR TRANSPORT ASSOCIATION OF AMERICA

18TH EDITION
Facts and Figures, 1957

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J. T. Trippe (PAA)
C. E. Woolman (DL)

MEMBER AIRLINES

AAXICO Airlines, *Howard J. Korth, Pres., P. O. Box 875, Miami Int'l Airport Branch, Miami, Florida.*
Alaska Airlines, *Nelson David, Pres., 2320 Sixth Avenue, Seattle 1, Washington*
Alaska Coastal Airlines, *O. F. Benecke, Co-Manager, 2 Marine Way, Juneau, Alaska*
Allegheny Airlines, *Leslie O. Barnes, Pres., Washington National Airport, Washington 1, D. C.*
American Airlines, *C. R. Smith, President, 100 Park Avenue New York 17, New York*
Bonanza Air Lines, *Edmund Converse, Pres., McCarran Field, P. O. Box 391, Las Vegas, Nevada*
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Capital Airlines, *J. H. Carmichael, Pres., Washington National Airport, Washington 1, D. C.*
***Caribbean Atlantic Airlines,** *Dionisio Trigo, Pres., P. O. Box 6035, Loiza Street Station, Santurce, Puerto Rico*
Central Airlines, *Keith Kable, Pres., Meacham Field, Fort Worth 7, Texas*
Chicago Helicopter Airways, *John S. Gleason, President & Treasurer, 5240 W. 63rd Street, Chicago 38, Illinois*
Continental Air Lines, *Robert F. Six, Pres., Stapleton Airfield, Denver 7, Colorado*
Cordova Airlines, *Merle K. Smith, President & Gen. Mgr., P. O. Box 1499, Anchorage, Alaska*
Delta Air Lines, *C. E. Woolman, Pres. & Gen. Mgr., Atlanta Airport, Atlanta, Georgia*
Eastern Air Lines, *E. V. Rickenbacker, Chairman of the Board & Gen. Mgr., 10 Rockefeller Plaza, New York 20, New York*
Ellis Air Lines, *R. E. Ellis, Pres., P. O. Box 1059, Ketchikan, Alaska*
The Flying Tiger Line, *Robert W. Prescott, Pres., Lockheed Air Terminal, Burbank, California*
Frontier Airlines, *C. A. Myhre, Pres., Stapleton Airfield, Denver 7, Colorado*
***Hawaiian Airlines,** *A. D. Lewis, Pres., Honolulu International Airport, Honolulu 17, T. H.*
Lake Central Airlines, *Gwin Hicks, Pres., Weir Cook Municipal Airport, Indianapolis 44, Indiana*
Los Angeles Airways, *C. M. Belinn, Pres., Box 45155, Airport Sta., Los Angeles 45, California*
Mackey Airlines, *Joseph C. Mackey, Pres., Broward County Int'l Airport, Ft. Lauderdale, Florida*
Mohawk Airlines, *Robert E. Peach, Pres., Cornell University Airport, Ithaca, New York*
National Airlines, *G. T. Baker, Pres., 3240 N. W. 27th Avenue, Miami 42, Florida*
New York Airways, *Robert L. Cummings, Jr., Pres., P. O. Box 426, LaGuardia Airport Station, Flushing 71, New York*
North Central Airlines, *Hal N. Carr, Pres., 6201 34th Ave., South Minneapolis 23, Minn.*
Northeast Airlines, *George E. Gardner, Pres., Logan Int'l. Airport, E. Boston 28, Mass.*
Northern Consolidated Airlines, *Raymond I. Petersen, Pres. & Gen. Mgr., 414 Fourth Avenue, Anchorage, Alaska*
Northwest Airlines, *D. W. Nyrop, Pres., 1885 University Avenue, St. Paul 1, Minnesota*
Ozark Air Lines, *Laddie H. D. Hamilton, Pres., Box 6007, Lambert Field, St. Louis 21, Missouri*
Pacific Northern Airlines, *A. G. Woodley, President, 1626 Exchange Building, Seattle 4, Washington*
Pan American-Grace Airways, *Andrew B. Shea, Pres., 135 E. 42nd Street, New York 17, New York*
Pan American World Airways, *J. T. Trippe, Pres., 135 E. 42nd Street, New York 17, New York*
Piedmont Airlines, *T. H. Davis, President, Smith Reynolds Airport, Winston-Salem 1, N. C.*
Reeve Aleutian Airways, *Robert C. Reeve, Pres. & Supt. Operations, 420 D Street, Box 559, Anchorage, Alaska*
Resort Airlines, *Harold L. Graham, Jr., Pres., Suite 326, 1346 Connecticut Ave., N. W., Washington 6, D. C.*
Riddle Airlines, *John Paul Riddle, Pres., P. O. Box 535, Miami International Airport Branch, Miami 48, Florida*
Seaboard & Western Airlines, *Raymond A. Norden, Pres., 80 Broad Street, New York 4, New York*
Slick Airways, *D. W. Rentzel, Chairman of the Board, P. O. Box 9547, Oklahoma City, Oklahoma*
Southern Airways, *Frank W. Hulse, Pres, 1140 Brown-Marx Building, Birmingham, Alabama*
Southwest Airways Company, *John H. Connelly, Pres., San Francisco International Airport, San Francisco, California*
***Trans-Canada Air Lines,** *W. Gordon Wood, Vice President-Traffic, Room 422, International Aviation Bldg., 1080 University Street, Montreal 3, Quebec, Canada*
Trans Texas Airways, *R. E. McKaughan, Pres., 1221 Commerce Building, Houston 2, Texas*
Trans World Airlines, *Warren Lee Pierson, Chairman of the Board, 806 Connecticut Avenue, Washington 6, D. C.*
United Air Lines, *W. A. Patterson, Pres., 5959 S. Cicero Avenue, Chicago 38, Illinois*
West Coast Airlines, *Nick Bez, Pres., Boeing Field, Seattle 8, Washington*
Western Air Lines, *T. C. Drinkwater, Pres., 6060 Avion Drive, Los Angeles 45, California*
Wien Alaska Airlines, *Sigurd Wien, President & General Manager, Box 649, Fairbanks, Alaska*

***Associate Member**

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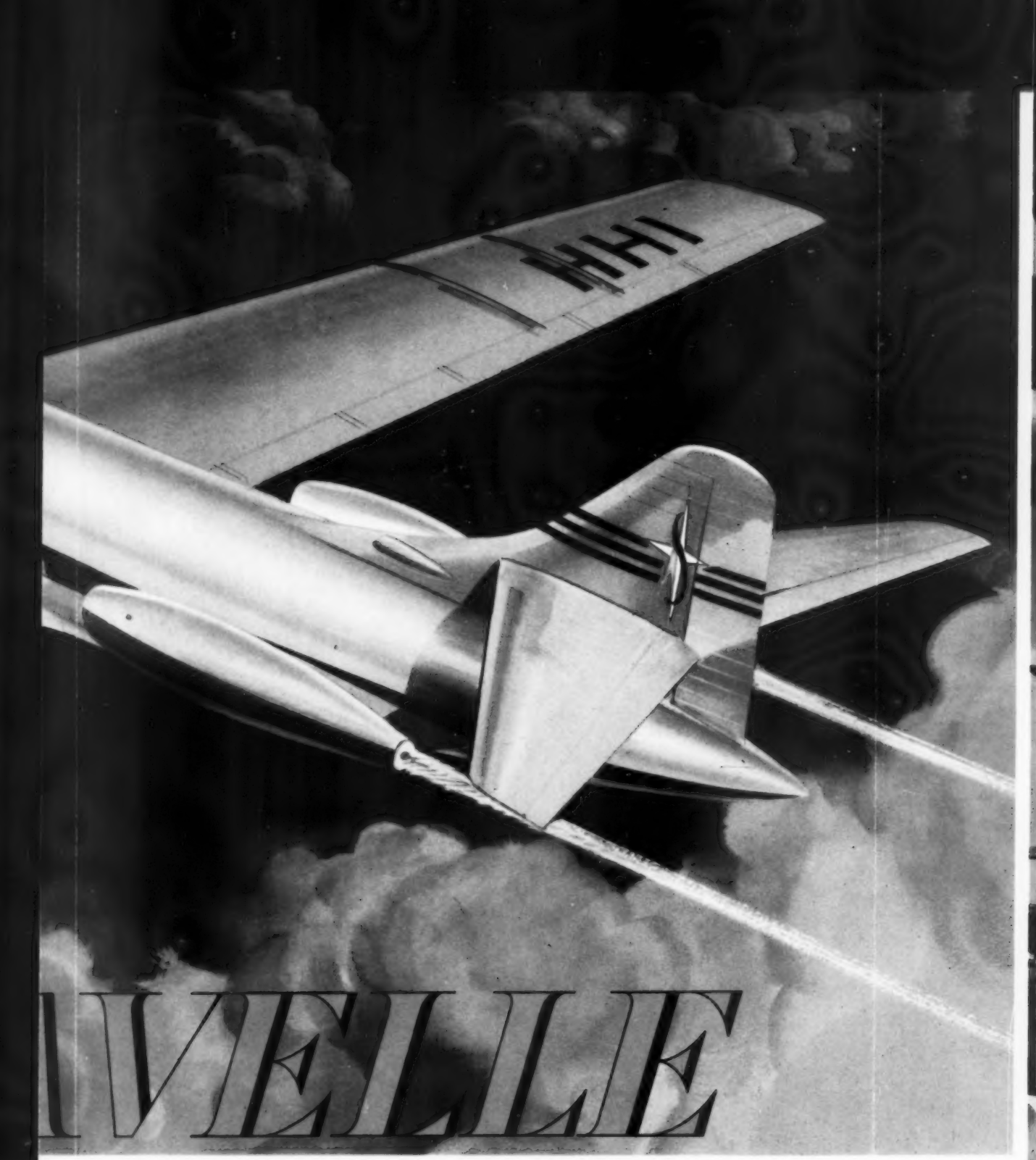
1107 SIXTEENTH ST., N.W., WASHINGTON, D. C.

CARA

From Sud Aviation has come a masterpiece of aeronautical engineering . . . a twin-jet aircraft designed to meet the most exacting specifications of any carrier . . . a plane that brings jet speed and jet comfort to all cities large enough for trunk line service.

It is faster than any competing plane in the medium range. It is the quietest. And, by all airline accounting methods including the ATA formula, it is the most economical.



The Caravelle is not just a plane on paper.
Prototypes have been in flight test, and in scheduled cargo use, for two years. Several years before, design work began and a program of exhaustive laboratory tests was started, covering components, sub-assemblies and two complete airframes.

Now, the Caravelle is ready for full use, is in full production. Price: approximately $1,950,000 for 1958-59 deliveries.

CRUISING SPEED

475-510 MPH

●

MAXIMUM RANGE WITH 64 PASSENGERS

2200 STATUTE MILES

A two man crew, but space for optional engineer

Low level construction permits fast ground handling

Eight main wheels, eight brakes for quick stops

Advanced *CARAVELLE* Design

Aft-Mounted Pods – 2 Rolls-Royce Avon RA 29 turbojets in rear-mounted nacelles permit a perfectly clean wing, structurally sound and aerodynamically pure – providing a unique combination of high cruising speed and short take-off and landing distances.

High Engine Pods, 9 feet above ground. Servicing personnel can approach the Caravelle while engines are running. Foreign objects or slush cannot be sucked from runways or aprons. The axes of the jet converge almost at the center of gravity – so that even sudden variations of power on one or two engines create no significant yawing or pitching.

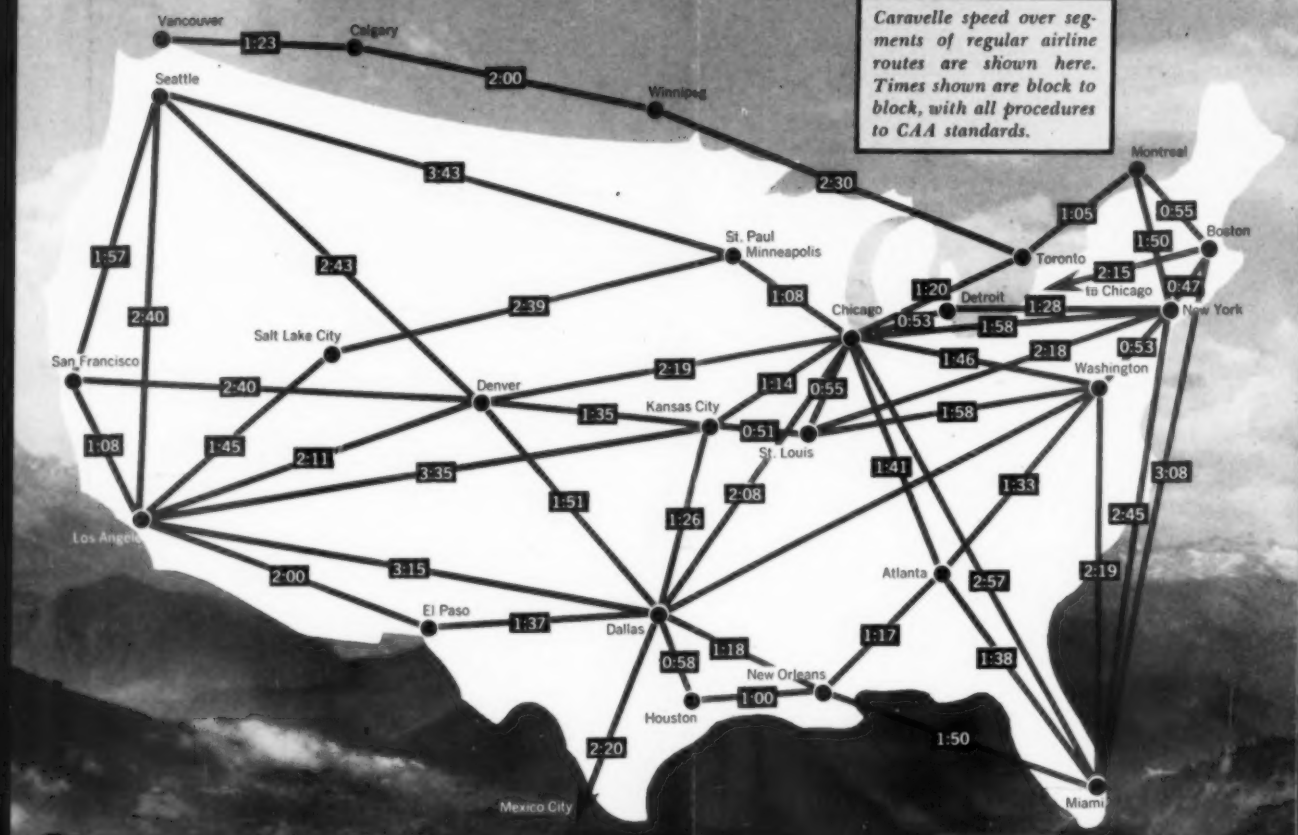
Flexible Interior Arrangement with mobile partitions is permitted by cylindrical unobstructed fuselage and by two entrances – a front door, of either conventional or cargo size, and the rear door with a hydraulic built-in ramp.

Low Floor Level, only 7 feet high, made possible by the high-mounted pods – allows quick and easy loading, unloading and servicing. Landing gear is short, compact and simple – it has been put through 80,000 simulated maneuvers.

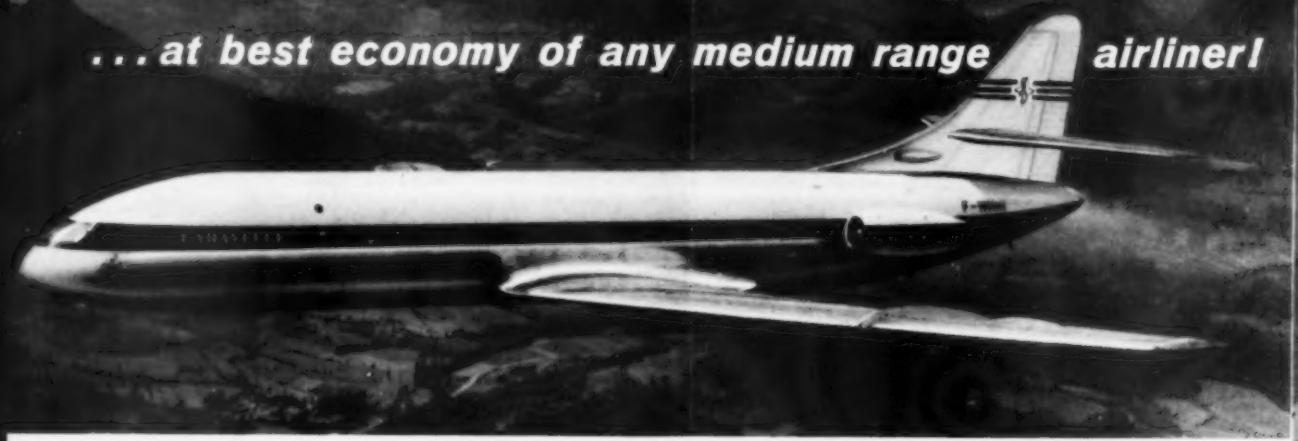
Simplicity – an irreplaceable factor of safety and economy. Simplicity of the intrinsic design and handling characteristics of the jet engine, simplicity of the special twin-engine configuration that makes flying on one engine with the Caravelle safer than flying on three with a conventional four-engine aircraft.

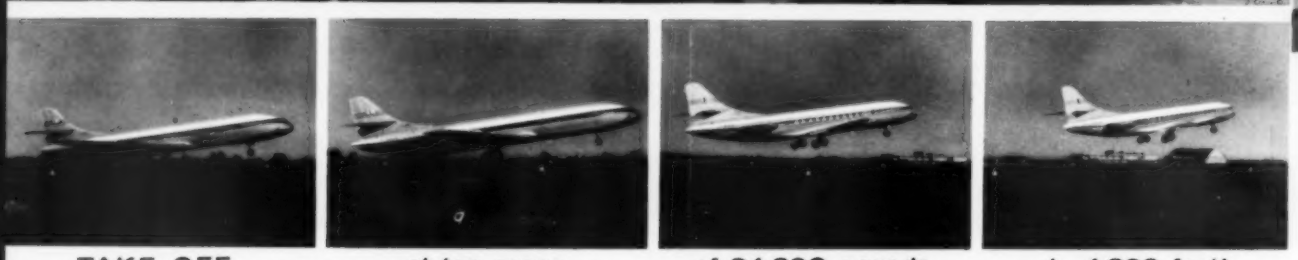
JET SPEED...for all the nation.....

Caravelle speed over segments of regular airline routes are shown here. Times shown are block to block, with all procedures to CAA standards.



...at best economy of any medium range airliner!





TAKE OFF.....at top gross.....of 94,800 pounds.....in 4,300 feet!

The Caravelle can use any airport in the United States that handles four-engined aircraft today. It more than meets all requirements for performance with one engine inoperative, for the Caravelle can *take off from a standing start with only one engine running.* Take off run in one engine-standing start tests was under 6,500 feet. Short take-off run, plus high rate of climb, permits fast climb-out' technique from airports with noise zone problems.

CARAVELLE

The aircraft of tomorrow for the runways of today

CARAVELLE

A Proven Jet

The only jet transport with more than 1,000 flight hours. Plus 1,875 hours wind tunnel time on six models, including high speed compressibility tests at Cornell Aeronautical Laboratory, as well as water tank skin stress and cyclic fatigue tests on every component.

A High-Speed Jet

475-510 mph cruising

2,000 fpm climb

6,000 fpm descent, with passenger comfort

A Comfortable Jet

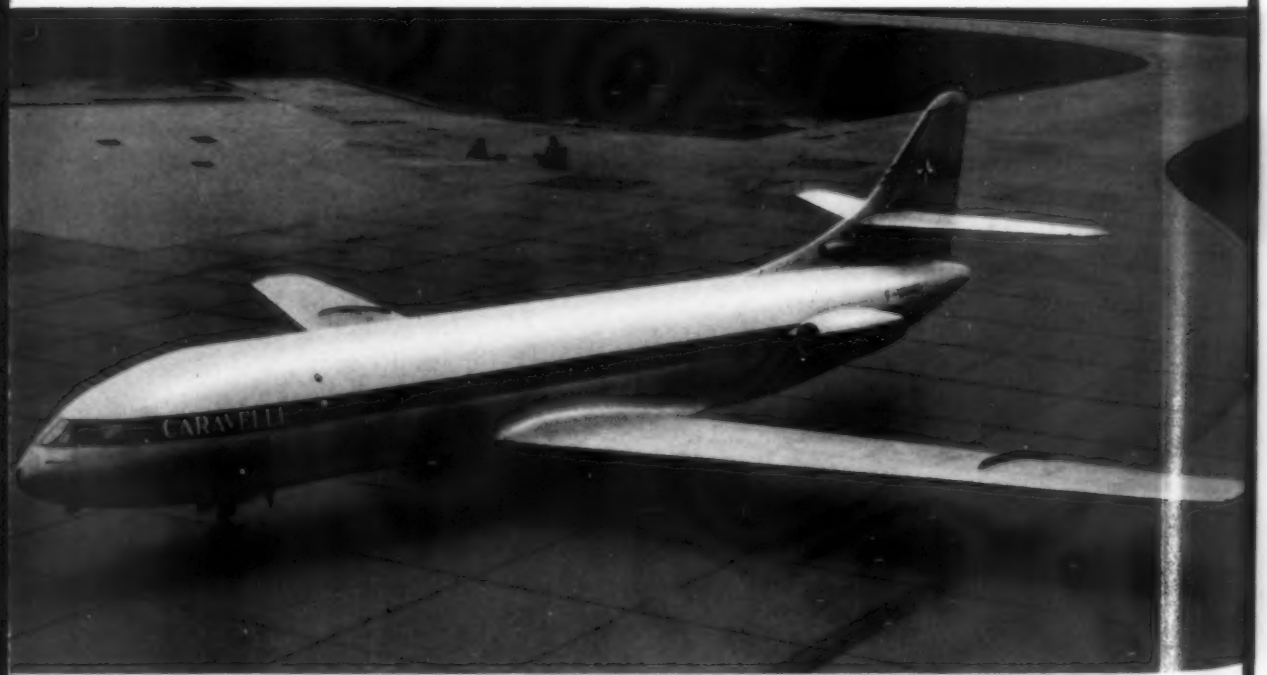
Jet exhaust is *behind* — not alongside passengers, resulting in the most silent aircraft cabin of all times. Vibration non-existent. Cruising altitude up to 40,000 is above weather. Stability is excellent. Passengers enjoy complete quiet and relaxation.

An Economical Jet

Capacity: 64-80 passengers or 19,840 pounds payload. Lowest seat mile cost of *any aircraft now flying or under construction*. Operates from any airport handling 4-engine piston planes. Uses minimum ground facilities; no portable steps required. Inspection and ramp loading at arm level. Permits simultaneous ground operations: passenger loading, rear steps . . . freight loading, belly and forward compartments . . . refueling, under wings . . . engine inspection, aft pods.

An Available Jet

Flight tested for two years . . . now tooled for current production and deliveries in 1958 and 1959.



Complete engineering data, specifications and economic analysis available on request. From North American point write:

SUD AVIATION CORPORATION

500 Fifth Avenue, New York 36, N.Y.

Sud Aviation . . . 37 Boulevard de Montmorency — Paris 16-E, France

Traffic Ratings, U.S. Scheduled Airlines, 1956

Rank	Airline	Revenue Passengers
1.	American ..	7,845,267
2.	Eastern	7,673,411
3.	United	6,283,709
4.	TWA	4,428,140
5.	Capital	2,984,410
6.	PAA	2,591,851
7.	Delta	2,429,269
8.	Braniff	1,820,673
9.	National ...	1,466,457
10.	Northwest ..	1,434,691
11.	Western ...	928,746
12.	Continental.	707,938
13.	Northeast ..	593,449
14.	N. Central..	551,775
15.	Hawaiian ..	417,980
16.	Piedmont ..	405,153
17.	Allegheny ..	393,668
18.	Mohawk ...	360,369
19.	Ozark	318,994
20.	Southwest .	289,240
21.	Trans-Texas	220,613
22.	West Coast.	214,874
23.	Trans-Pac...	206,624
24.	Frontier ...	197,902
25.	Southern ..	191,080
26.	Caribair ...	177,795
27.	Panagra ...	143,222
28.	Lake Central	136,956
29.	Bonanza ..	132,204
30.	Pac.North...	117,231
31.	Central	107,758
32.	Ellis	61,542
33.	Alaska	56,223
34.	Alas. Coast.	47,258
35.	N.Y. Airways	43,205
36.	Wien Alaska	23,390
37.	N. Consol. .	22,163
38.	Los Angeles	20,419
39.	Cordova ...	17,849
40.	Reeve	6,740
41.	Aerovias ...	.....
42.	Chi. Helicopter..	.....
43.	Flying Tiger	.....
44.	Riddle	.....
45.	Seabd.&West.	.....
46.	Slick	.....
	TOTAL ..	46,070,238

Rank	Airline	Revenue Passenger Miles (000 omitted)
1.	American ..	4,899,629
2.	United	4,518,949
3.	Eastern ...	4,128,860
4.	TWA	3,977,405
5.	PAA	3,385,981
6.	Delta	1,191,946
7.	Northwest ..	1,103,130
8.	Capital	1,021,564
9.	National ...	1,011,387
10.	Braniff	791,286
11.	Western ...	458,131
12.	Continental.	259,595
13.	Panagra ...	172,103
14.	Northeast ..	119,454
15.	Pac. North..	92,150
16.	N. Central..	85,659
17.	Piedmont ..	77,136
18.	Allegheny .	64,942
19.	Mohawk ...	64,708
20.	Southwest .	59,398
21.	Hawaiian ..	57,838
22.	Frontier ...	53,300
23.	Trans-Texas	50,184
24.	Ozark	49,013
25.	West Coast.	38,134
26.	Southern ..	33,752
27.	Bonanza ..	28,919
28.	Trans-Pac...	26,032
29.	Lake Central	21,368
30.	Central	19,760
31.	Wien Alaska	15,296
32.	Alaska	15,217
33.	Caribair ...	12,774
34.	N. Consol...	7,134
35	Alaska Coast	4,303
36.	Reeve	3,607
37.	Ellis	3,124
38.	Cordova ...	3,028
39.	N.Y. Airways	815
40.	Los Angeles	779
41.	Aerovias ...	.....
42.	Chi. Helicopter..	.....
43.	Flying Tiger	.....
44.	Riddle	.....
45.	Seabd.&West.	.....
46.	Slick	.....
	TOTAL ..	27,927,790

Rank	Airline	Mail Ton-Miles
1.	PAA	30,508,370
2.	United	28,184,122
3.	TWA	22,236,960
4.	American ..	20,180,882
5.	Northwest ..	16,258,508
6.	Eastern ...	12,086,026
7.	Delta	3,908,204
8.	National ..	3,393,211
9.	Capital	3,257,633
10.	Braniff	2,867,184
11.	Western ...	2,211,731
12.	Pac. North..	904,126
13.	Continental.	871,246
14.	Panagra ...	665,801
15.	Wien Alaska	389,762
16.	Frontier .	343,045
17.	Alaska	340,253
18.	N. Consol. .	259,460
19.	N. Central..	226,220
20.	Piedmont ..	172,230
21.	Trans-Texas	161,719
22.	Northeast ..	127,530
23.	Ozark	115,452
24.	Southern ..	101,542
25.	Southwest .	95,993
26.	Allegheny .	86,867
27.	Mohawk ...	63,197
28.	Hawaiian ..	52,791
29.	Bonanza ..	49,162
30.	Los Angeles	49,032
31.	Alaska Coast	48,166
32.	West Coast.	47,240
33.	Central	46,835
34.	Cordova ...	39,625
35.	Chi. Helicopter..	28,906
36.	Lake Central	26,594
37.	Ellis	24,350
38.	Caribair ...	15,233
39.	N.Y. Airways	12,358
40.	Trans-Pac. .	11,943
41.	Aerovias ...	.....
42.	Flying Tiger	.....
43.	Reeve	.....
44.	Riddle	.....
45.	Seabd.&West.	.....
46.	Slick	.....
	TOTAL ..	150,469,514

Rank	Airline	Express Ton-Miles
1.	United	12,748,567
2.	American .	10,756,847
3.	TWA	9,090,353
4.	Eastern ...	5,341,545
5.	Delta	3,219,837
6.	Northwest .	2,961,591
7.	Capital	2,261,523
8.	Braniff	1,541,194
9.	Western ...	805,483
10.	National ..	751,456
11.	N. Central .	361,346
12.	Continental.	316,589
13.	Allegheny .	214,787
14.	Ozark	200,628
15.	Northeast ..	190,964
16.	Southern ..	155,411
17.	Piedmont ..	153,487
18.	Lake Central	147,554
19.	Mohawk ...	107,206
20.	Trans-Texas	104,961
21.	Southwest .	101,724
22.	Frontier ...	96,531
23.	Bonanza ..	30,123
24.	Central	29,631
25.	West Coast..	27,007
26.	Los Angeles	21,338
27.	N.Y. Airways	14,965
28.	N. Consol. .	3,320
29.	Aerovias ...	.....
30.	Alaska	.....
31.	Alaska Coast	.....
32.	Caribair ...	.....
33.	Chi. Helicopter..	.....
34.	Cordova ...	.....
35.	Ellis	.....
36	Flying Tiger	.....
37.	Hawaiian ..	.....
38.	Pac. North.	.....
39.	PAA	.....
40.	Panagra ...	.....
41.	Reeve	.....
42.	Riddle	.....
43.	Seabd.&West.	.....
44.	Slick	.....
45.	Trans-Pac..	.....
46.	Wien Alaska	.....
	TOTAL ..	51,755,968

Rank	Airline	Freight Ton-Miles
1.	PAA	83,528,030
2.	American ..	74,799,755
3.	Flying Tiger	67,617,048
4.	Slick	63,565,183
5.	United	50,858,923
6.	TWA	32,810,627
7.	Northwest .	17,699,169
8.	Eastern ...	15,607,835
9.	Seabd.&West.	15,531,146*
10.	Wien Alaska	10,585,566
11.	Aerovias ...	8,038,275
12.	Delta	7,791,058
13.	National ..	5,313,577
14.	Braniff	4,968,808
15.	Riddle	4,594,090†
16.	N. Consol. .	4,364,634
17.	Panagra ...	4,029,161
18.	Capital	3,562,260
19.	Pac. North.	3,367,514
20.	Alaska	2,885,500
21.	Cordova ...	1,921,236
22.	Western ...	1,649,995
23.	Hawaiian ..	1,339,434
24.	Continental.	1,242,554
25.	Frontier ...	645,370
26.	Reeve	377,409
27.	Northeast .	305,551
28.	Trans-Texas	241,458
29.	Piedmont .	144,474
30.	Trans-Pac. .	138,873
31.	Mohawk ...	125,969
32.	Southwest .	101,724
33.	Ozark	80,465
34.	Bonanza ..	76,786
35.	Allegheny .	72,412
36.	Central ...	67,783
37.	West Coast.	63,772
38.	Alas. Coast.	48,666
39.	Caribair ...	32,023
40.	Ellis	31,697
41.	N.Y. Airways	6,762
42.	Lake Central	453
43.	Chi. Helicopter.	.....
44.	Los Angeles	.....
45.	N. Central .	.....
46.	Southern ..	.....
	TOTAL ..	490,233,025

NOTES: In above tabulation, domestic and international operations of companies are combined.
Above figures include both scheduled and non-scheduled operations.
Mail ton-miles include air parcel post and first-class mail carried by air.
** Seaboard & Western figures are for the last three quarters only.*
† Riddle figures are for first quarter only; figures for remainder of year not available.

Load factors and scheduling shape air transport economics

Two key factors spelling the financial success of any airline operation are (1) the ability to attract a high percentage of passengers in relation to the number of seats in its aircraft and (2) the scheduling of these aircraft to get the best revenue return for the weight-carrying capacity they make available in day to day operations.

This performance is recorded in two airline operating statistics reported to the Civil Aeronautics Board: (1) passenger load factor expressed in a percentage of what all planes would carry if always filled to capacity; and (2) the percentage of revenue-producing ton-miles flown to that actually made available.

In the interest of expanding the statistical coverage of airline operations in the Annual Air Transport Progress Issue, AMERICAN AVIATION this year adds a comprehensive listing of this information by type of equipment for all scheduled airlines.

Significant in this tabulation is the wide spread in both load factors and revenue ton-mile performance percentages *within* such operations as that of the local service airlines as well as between feeder service and major trunk operations.

For example, the "grass roots" air transport pioneering atmosphere of local service is quite evident in operations showing load factors below 40%, in one instance only 33.78% for a feeder airline.

Airline operations summary

DOUGLAS DC-3

Airline	No. Acft.	Load Factor	Rev. to Avail. Ton-Miles
BAL	9	43.87	42.53
BNF	22	53.31	52.70
CAA	4	58.67	56.35
CAL	15	48.28	44.42
CEN	12	33.78	30.42
DAL	14	53.92	57.44
EAL	8	54.00	51.92
FAL	13	47.76	58.06
HAL	6	57.56	54.01
LCA	10	43.20	27.69
MOH	8	54.75	54.58

OPERATIONS

Airline	No. Acft.	Load Factor	Rev. to Avail. Ton-Miles
NEA	12	56.37	53.99
NOR	23	51.65	46.41
NWA	6	56.56	48.02
OZA	20	44.49	38.49
PAI	20	52.83	52.80
SOU	13	44.89	42.82
SWA	10	46.35	46.93
TPA	8	53.44	52.76
TTA	20	39.45	36.41
UAL	3	56.66	53.97
WCA	14	49.62	50.04
DOUGLAS DC-4			
CAP	14	53.25	44.80
EAL	11	51.32	54.33
NEA	1	57.74	47.99
NWA	19	56.01	57.79
PAA-ALA	1	64.09	53.64
-ATL	6	70.58	61.08
-LAD	13	60.00	63.00
-PAC	4	72.61	62.31
Panagra	2	65.21	67.37
TWA	10	55.10	51.01
UAL	10	72.25	65.21
WAL	2	71.90	63.90
DOUGLAS DC-6			
AA	50	69.80	66.40
BNF	9	51.74	47.43
CAP	*	53.42	47.47
CAL	3	68.14	50.21
DAL	7	67.00	64.87
NAL	4	70.17	67.85
PAA-LAD	4	63.00	65.00
UAL	42	69.52	66.23
DOUGLAS DC-6A			
AA	7	....	63.40
PAA-ATL	1	....	52.00
-LAD	2	....	75.00
UAL	5	....	68.18
DOUGLAS DC-6B			
AA	25	62.70	49.70
CAP	*	49.86	39.24
EAL	*	67.78	57.39
NAL	8	68.10	76.88
NWA	10	66.67	65.54
PAA-ATL	15	59.07	58.08
-LAD	24	63.00	64.00
-PAC	..	68.91	68.17
Panagra	5	61.75	58.95
UAL	30	69.17	57.56
WAL	14	62.50	54.40
DOUGLAS DC-7			
AA	39	68.80	56.40
DAL	11	61.20	50.11
NAL	4	69.81	62.55
UAL	27	69.17	53.88
DOUGLAS DC-7B			
EAL	20	69.96	47.94
NAL	*	69.43	53.97
PAA-ATL	3	65.25	64.23
-LAD	4	57.00	60.00
Panagra	5	57.36	58.69
DOUGLAS DC-7C			
BNF	4	58.97	35.92
PAA-ATL	8	68.33	68.00
-PAC	8	74.89	64.84
LOCKHEED L-049			
BNF	2	64.78	55.12
CAP	12	63.16	36.73
DAL	4	35.99	36.12
EAL	5	43.71	39.43
NAL	*	65.54	43.38
PAA-LAD	1	55.00	58.00
TWA	32	66.19	64.90
LOCKHEED L-749			
EAL	18	60.32	40.90
TWA	39	57.92	59.25
LOCKHEED L-1049			
EAL	13	63.63	57.38
TWA	9	62.47	51.21
LOCKHEED L-1049C			
EAL	16	61.87	46.90
LOCKHEED L-1049G			
EAL	10	50.56	38.96
NWA	4	57.63	72.77
TWA	28	70.01	61.21
LOCKHEED L-1049H			
EAL	4	53.58	44.56
BOEING 377			
NWA	9	59.70	48.11
PAA-ALA	3	57.50	51.77
-ATL	8	65.74	67.69
-PAC	14	73.21	70.36
CONVAIR 240			
AA	74	70.00	69.40
MOH	8	52.25	52.56
NEA	6	61.22	60.26
PAA	5	57.00	62.00
WAL	14	62.50	54.40
CONVAIR 340			
BNF	30	65.42	57.76
CAP	*	56.24	49.25
CAL	9	50.73	44.76
DAL	25	57.51	50.96

(*Continued on page* 119)

Dynamic Growth

...FRONTIER AIRLINES and the WEST!

Growing with the new, expanding West, here's how Frontier Airlines now stands among 13 Local Service Airlines

No. 1 *in Penetration of Population (passengers per capita)*

No. 1 *in Airfreight Tonnage (40% of all Air Freight carried by Local Service Airlines)*

No. 1 *in Mail Tonnage*

No. 2 *in Percentage of Schedule Miles Completed*

No. 2 *in Utilization of Aircraft (hours per day)*

No. 2 *in Load Factor (available ton miles used)*

FAL

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*U.S. patent

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OPERATIONS

Airline	No. Acft.	Load Factor	R/A Ton-Miles
EAL	*	68.76	47.92
HAL	5	60.48	54.97
NAL	18	49.95	47.57
UAL	55	57.52	54.00
CURTISS C-46/CW20T			
NEA	1	49.37	36.23
MARTIN 2-0-2/4-0-4			
AAA	5	39.37	41.22
EAL	59	54.44	49.95
SWA	7	49.91	47.50
TWA	48	62.60	61.66
VISCOUNT			
CAP	53	62.97	51.72
Helicopter Operations			
BELL 47			
CHA	6	....	42.5
SIKORSKY S-51			
LAA	2	....	40.20
SIKORSKY S-55			
CHA	3	22.30	18.70
LAA	5	43.29	50.56
NYA	5	54.67	58.27
SIKORSKY S-58			
NYA	2	31.67	35.79

Airlines reduce direct operating costs on eight of 13 aircraft types in '56

On the eve of an aviation gasoline price hike that promises to increase airline out-of-pocket expenses to all-time highs, U.S. scheduled carriers during 1956 were successful in holding the line on direct operating costs.

Despite continuing increases in labor and material costs, carriers showed a reduction in direct operating costs on eight out of 13 aircraft types.

Their efforts to harness mounting maintenance costs, however, were not as fruitful, with some 10 out of the 13 models showing marked increases. Where average maintenance costs per hour of flight were trimmed 1% to 2% on DC-3s, Convair 240s and 340s, increases ranging up to 31% were experienced on some aircraft types.

Here's how the various models fared in both cost areas:

Douglas DC-3—Of 24 carriers, 17 showed increased direct operating costs, but cost reductions by the remaining seven held the average increase to 0.25¢ per plane mile. Average maintenance costs per flight hour dropped from $17.89 in 1955 to $17.53 last year, a 2% decrease.

Douglas DC-4—Average DOC for 14 DC-4 operators increased about 15% as 12 of 14 carriers reported cost hikes. Average for all operations was 93.90¢ compared to 81.36¢ in 1955. DC-4 maintenance costs likewise increased 6% from an average of $44.84 reported by seven airlines in '55 to $47.79 for eight carriers last year.

Douglas DC-6—In DC-6 operations, average DOC dropped about 6% as maintenance costs increased 5.8%. Direct plane-mile costs for 10 airlines averaged 93.41¢ against 99.63¢ the previous year and maintenance costs rose from $56.96 to $60.39 per flight hour. DC-6A direct costs were up slightly for two out of three operators and averaged 111.51¢ per plane mile. Maintenance costs averaged $56.58.

Douglas DC-6B—Average of direct costs in 11 specific operations was 116.47¢, a drop from 116.34¢ in 1955. Maintenance costs jumped 16% for eight reporting airlines and averaged $59.56. Average for six of these carriers in 1955 was $51.33.

Douglas DC-7—1956 figures for seven separate operations averaged 126.91¢ in direct operating costs, a 2.8% increase, as maintenance costs increased 1.25% from $95.63 to $96.83 per flight hour. First reported costs on DC-7B and C models showed an average direct cost of 149.14¢ and maintenance cost of $74.92, but limited operation following their introduction during the year does not lend the statistics to comparison with earlier DC-7s.

Convair 240—Here, both direct costs and maintenance costs showed declines. DOC for five airlines averaged 79.40¢ against 80.11¢ the previous year and maintenance costs dropped from an average $48.56 to $48.04. Combined 340 and 440 operations were down in both categories, too, as direct costs dropped 4% from 80.46¢ to 77.18¢ and maintenance costs from $37.80 to $37.04.

Curtiss C-46/CW20T—First full year report shows direct costs of 81.61¢ and maintenance costs of $30.53 averaged by two carriers.

Lockheed L-49—Declining operation of this earliest model Constellation limits comparison. Carriers averaged 136.39¢ in DOC and $101.90 in maintenance costs. Models 649 and 749 showed a reduction in DOC from 110.12¢ in 1955 to 106.60¢ last year, but maintenance costs increased from $67.77 to $71.66 on the average.

Lockheed 1049—Direct costs dipped from 136.17¢ in '55 to 110.71¢ as maintenance costs jumped from $75.98 to $87.78 for the respective years. Model 1049C showed DOC of 155.50¢ for one reporting airline as maintenance costs were increasing 27% from $78.14 to $99.01. Model 1049G operated by three carriers showed increases in both categories with direct costs rising from an average 180.59¢ to 190.91¢ and maintenance costs from $66.35 to $86.79.

Boeing 377—Direct costs dropped from 171.02¢ to 158.42¢ as maintenance costs rose from $94.47 to $98.64 for three distinct airline operations.

Vickers Viscount—First statistics reported for a full year's turboprop operation show a direct operating cost of 75.80¢ and maintenance cost of $34.45 per flight hour.

Helicopters—Three operators of Sikorsky S-55s showed an average direct operating cost of 178.00¢ per mile and maintenance costs of $28.84 per flight hour. By comparative fixed-wing figures, this placed the helicopter above the average direct costs of all types except the Lockheed 1049G and maintenance costs between those of the DC-3 and Convair 340 series.

Specific figures reported by carriers by types of equipment for the past three years:

EDITOR'S NOTE: *Direct operating costs shown here for 1954 through 1956 make interesting general comparisons but are not suitable for comparing costs of any two airlines operating the same type aircraft. Such an appraisal demands more detailed information on the carrier's depreciation of equipment, route structure (trunk or local service), type of operation and scope of equipment modifications. All figures expressed in cents per plane-mile.*

Airline	1956	1955	1954
DOUGLAS DC-3			
AAA	51.96	50.85	53.27
BAL	46.62	46.43	46.82
BNF	42.75	44.07	45.87
CAA	58.93	65.06	.....
CAL	48.30	47.14	49.32
CAP	45.70	45.40	45.70
CEN	53.96	50.03	52.43
DAL	44.92	43.81	45.71
EAL	47.46	58.91	63.00
FAL	48.52	47.78	47.11
HAL	57.90	56.56	51.61
LCA	50.19	51.87	55.41
MOH	57.30	54.00	54.30
NEA	55.20	55.10	50.02
NOR	46.90	49.74	54.36
NWA	55.65	55.05	61.67
OZA	53.27	52.53	53.94
PAI	50.91	48.41	51.03
SOU	47.13	45.54	46.95
SWA	58.87	49.71	50.01
TPA	50.83	45.32	44.80
TTA	47.11	47.98	45.46
UAL	73.11	74.67	50.86
WAL	48.90	41.63	44.47
WCA	48.74	50.22	49.25
DOUGLAS DC-4			
AA	110.00	79.00	79.40
CAP	74.10	68.70	66.90
EAL	96.48	70.72	.....
NEA	149.10	.....	.....
NWA ...	74.08	72.55	77.01
	90.39F	89.44F	94.33F
PAA-ALA	77.00	75.00	86.93
-ATL	85.44	99.00	106.00
-LAD	81.00	76.00	.....
-PAC	85.00	104.00	121.12
TWA ...	90.28	74.80	.....
	158.01	122.73FC	.....
UAL	74.04	70.05	65.59
	69.36C	68.81C	62.78C
WAL	94.30	68.32	65.81
DOUGLAS DC-6			
AA	80.00	84.00	93.40
	80.00F	89.00F	90.90F
BNF	86.98	92.13	92.62
	99.35F	98.61F	105.51F
DAL	90.09	119.10	99.24
NAL	98.48	109.73	101.76
	93.35	105.09F	109.68F

DIRECT OPERATING COSTS

Airline	1956	1955	1954
PAA-LAD	138.00	127.00	.....
UAL	82.19	84.41	87.95
	85.70F	87.23F	87.37F
DOUGLAS DC-6A			
AA	108.00	103.00	104.10
PAA-ATL	118.99	136.00	131.00
-LAD	105.00	94.00	.....
UAL	114.05	.....	.....
DOUGLAS DC-6B			
AA	102.00	.....	.....
	103.00F	.....	.....
CAL	123.80	139.65	.....
NAL	108.04	110.79	105.39
	86.87F	111.62F	104.96F
NWA ...	121.04	116.19	107.60
	121.57F	127.13F	122.23F
PAA-ATL	141.32	136.00	144.00
-LAD	129.00	112.00	.....
UAL	97.69	97.44	99.14
	93.21F	.....	.....
WAL	98.10	96.25	99.26
DOUGLAS DC-7			
AA	123.00	125.00	127.70
DAL	128.07	123.39	125.80
	134.99F	137.11F	.....
NAL	137.70	135.73	125.59
	127.27F	111.62F	.....
UAL	114.58	111.49	99.14
	122.75F	119.89F	.....
DOUGLAS DC-7B/C			
BNF	95.79*	.....	.....
EAL	154.48	166.71	.....
NAL	163.95**	.....	.....
PAA-ATL	154.80*	.....	.....
	143.96	.....	.....
PAA-LAD	194.00*	.....	.....
	137.00	.....	.....

*DC-7B. **Interchange equipment.

CONVAIR 240			
AA	64.00	71.00	80.10
MOH	99.90	93.56	.....
NEA	95.90	92.50	91.28
PAA-LAD	68.00	75.00	.....
WAL	69.20	68.48	69.62
CONVAIR 340/440			
BNF	70.55	74.99	76.36
CAL	72.90	71.50	.....
DAL	71.94	77.00	73.34
	75.49F	80.31F	77.62F
HAL	87.47	98.14	105.21
NAL	45.82	78.88	78.95
	48.89F	79.56F	76.99F
UAL	84.77	83.33	81.07
C46/CW20T			
BNF	65.63C	72.55C	.....
NEA	97.60	.....	.....
LOCKHEED L-49			
BNF	144.01	124.10	.....
CAP	121.10	.....	.....
DAL	177.70	.....	.....
NAL	115.47*	.....	.....
PAA-LAD	159.00	115.00	.....
TWA	101.10	93.62	104.02

*Interchange equipment.

LOCKHEED 649/749			
EAL	94.60	94.99	86.25
	88.10F	.....	.....
TWA	109.32	101.95	.....
	134.39F	133.42F	.....
LOCKHEED 1049			
EAL	96.95	135.44	132.37
	101.49F	.....	.....
TWA	133.70	136.90	.....
LOCKHEED 1049C			
EAL	154.64	145.52	142.84
	146.36F	.....	.....
LOCKHEED 1049G			
EAL	273.48	.....	.....
NWA	177.48	175.78	.....
	182.44F	.....	.....
TWA	143.69	136.90	.....
	177.48	229.10	.....
MARTIN 2-0-2			
AAA	90.89	.....	.....
SWA	81.69	83.24	89.80
MARTIN 4-0-4			
EAL	70.95	86.95	89.94
TWA	88.71	85.73	.....
VISCOUNT			
CAP	75.80	.....	.....
BOEING 377			
NWA ...	156.83	158.84	163.69
	153.69F	194.39F	194.87F
PAA-ALA	168.00	.....	.....
-ATL	168.61	.....	.....
-PAC	145.00	160.00	174.13

HELICOPTER OPERATIONS

BELL 47			
CHA	82.00	67.30	.....
NYA	261.00	.....	.....
SIKORSKY S-51			
LAA	84.00	.....	.....
SIKORSKY S-55			
CHA	212.00	.....	.....
NYA	202.00	185.00	.....
LAA	121.00	.....	.....
SIKORSKY S-58			
NYA	270.00	.....	.....

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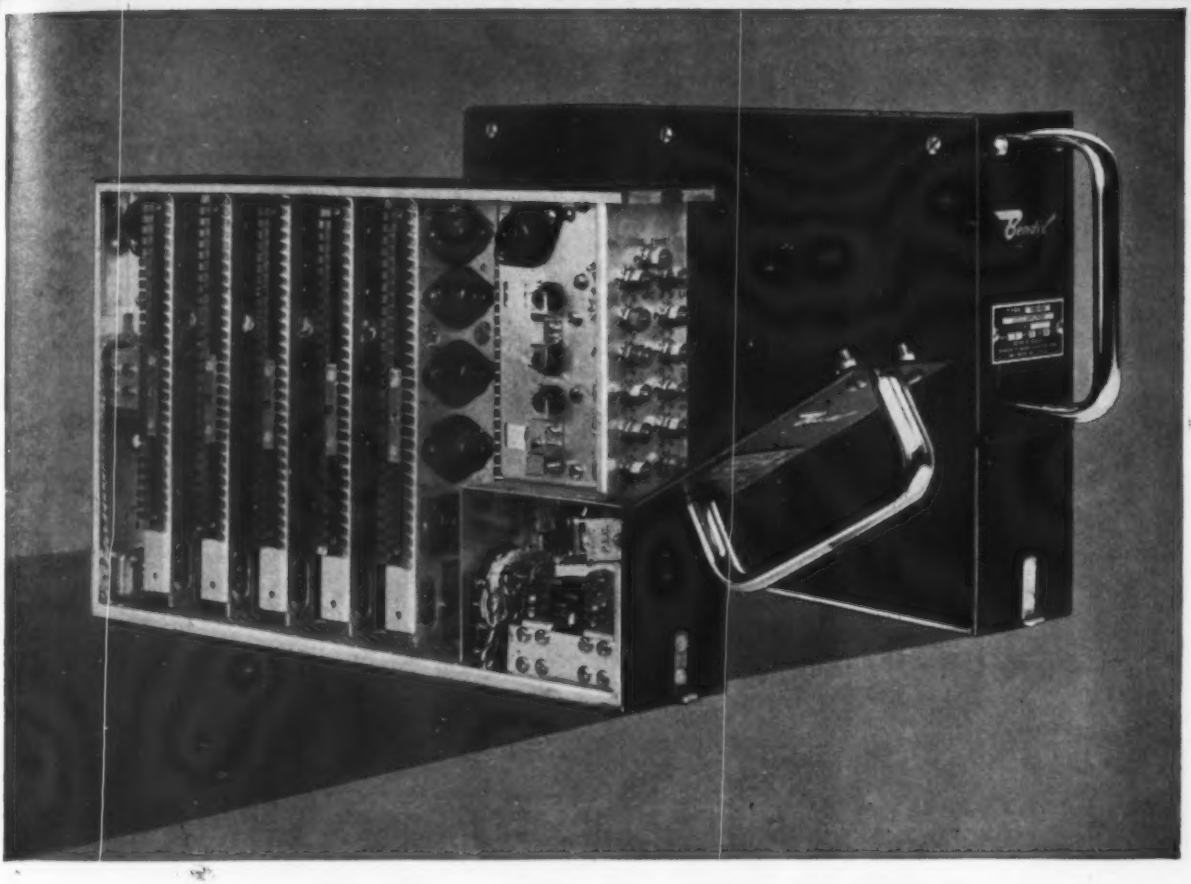

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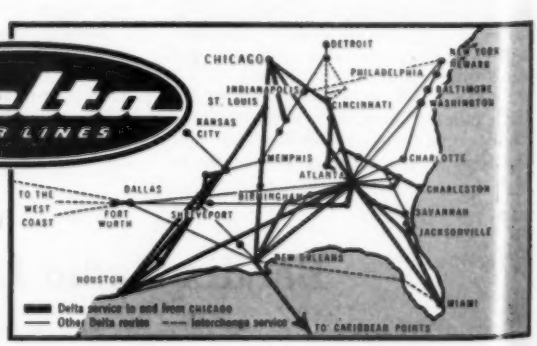

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MAINTENANCE COSTS

Airline	1956	1955	1954
DOUGLAS DC-3			
AAA	$17.63	$17.66	$16.99
BAL	16.77	15.77	18.34
BNF	16.32	16.90	16.58
CAL	15.49	16.73	....
CAP	16.43	14.65	14.03
CBA	29.26	31.00	34.00
CEN	18.66	17.96	18.22
DAL	17.98	15.09	15.71
EAL	19.29	22.79*	24.75*
FAL	15.87	....	....
HAL	22.77	24.78	20.40
LCA	18.19	19.45	21.65
MOH	20.50	18.44	17.20
NEA	19.20	20.40	17.89
NOR	18.07	19.08	....
NWA	23.00	18.49	16.16
OZA	21.31	20.09	18.76
PAI	19.04	17.58	18.53
SOU	16.05	15.92	18.70
SWA	....	17.48	14.18
TPA	16.56	16.12	16.85
TTA	18.83	17.47	14.27
UAL	42.10	34.55	18.99
WAL	21.51	14.16	....
WCA	13.30	13.55	13.35

*Former Colonial Airlines DC-3s.

DOUGLAS DC-4			
AA	$101.36	$66.91	$62.94
CAP	42.49	37.23	36.89
EAL	55.07	47.22*	48.90*
NEA	11.90	....	....
NWA	41.97	40.53	41.16
PAA-ATL	48.33	52.17	40.10
-LAD	54.69	....	....
-PAC	44.20	51.21	52.61
TWA	60.54	46.16	43.92
UAL	41.97	39.35	28.18
WAL	71.57	38.58	....

*Former Colonial Airlines DC-4s.

DOUGLAS DC-6			
AA	$62.84	$50.60	$57.57
BNF	57.70	64.31	55.66
CAL	46.46	32.65	....
DAL	66.70	83.23	55.78
NAL	51.45	....	....
PAA-LAD	82.59	....	....
UAL	55.04	54.02	38.15
DOUGLAS DC-6A			
AA	$44.42	....	....
PAA-ATL	65.22	....	....
-LAD	56.21	....	....
UAL	60.48	....	....
DOUGLAS DC-6B			
AA	$62.18	$....	$....
NAL	51.89	57.85	61.12
NWA	52.01	46.37	34.49
PAA-ATL	68.38	56.29	57.15
-LAD	75.73	....	....
-PAC	68.65	52.04	....
UAL	53.99	52.26	38.55
WAL	43.64	43.18	....
DOUGLAS DC-7			
AA	$ 94.63	$105.60	$105.89
DAL	109.26	85.97	99.66
NAL	103.13	113.30	83.39
UAL	80.30	77.66	41.30
DOUGLAS DC-7B/C			
BNF	$27.53	....	....
EAL	83.85*	....	....
PAA-ATL	60.30	....	....
	92.49*	....	....
-LAD	32.16*	....	....
-PAC	63.05	....	....

*DC-7B

CONVAIR 240			
AA	$42.90	$41.02	$48.31
MOH	60.20	61.27	....
NEA	53.48	52.90	63.08
PAA-LAD	38.18	....	....
WAL	45.42	39.06	....
CONVAIR 340/440			
BNF	$36.77	$39.06	$37.02
CAL	36.76	36.29	....
DAL	34.44	40.08	37.17
HAL	37.90	35.45	38.89
NAL	37.24	37.08	33.01
UAL	39.12	38.86	28.04
C46-CW-20T			
BNF	$31.37	....	....
NEA	29.69	....	....
LOCKHEED L-49			
BNF	$102.53	$52.78	$....
DAL	114.55	....	....
PAA-LAD	102.73	....	....
TWA	87.79	68.72	50.93
LOCKHEED L-649/749			
EAL	$72.38	$78.61	$47.08
TWA	70.94	56.93	48.43
LOCKHEED 1049			
EAL	$77.24	$72.01	$70.94
TWA	98.53	79.94	53.33
LOCKHEED 1049C			
EAL	$99.01	$78.14	$75.32
LOCKHEED 1049G			
EAL	$65.03	$....	....
NWA	87.45	71.10	....
TWA	107.90	61.60	....
BOEING 377			
NWA	$98.98	$96.13	$101.56
PAA-ALT	111.51	....	....
-PAC	85.45	92.81	88.66

MARTIN 2-0-2			
AAA	$38.98	$52.40	$....
SWA	....	42.51	38.18
MARTIN 4-0-4			
DAL	$42.93*	$....	$....
EAL	33.76	34.51	33.67
TWA	49.99	38.46	30.71

*Interchange equipment

VISCOUNT			
CAP	$34.45	....	....
Helicopter Operations			
BELL 47			
CHA	$15.25	$....	....
NYA	28.50	....	....
SIKORSKY S-51			
LAA	$23.62	$....	....
SIKORSKY S-55			
CHA	$15.85	$....	....
NYA	41.54	....	....
SIKORSKY S-58			
NYA	$24.75	....	....

AIRCRAFT SEATING

Airline	No. of Seats*
DOUGLAS DC-3	
AAA	24-25-26
BAL	28
BNF	21-24
CAL	21-24
CAP	24
CBA	28
DAL	25
EAL	26
FAL	24
HAL	31

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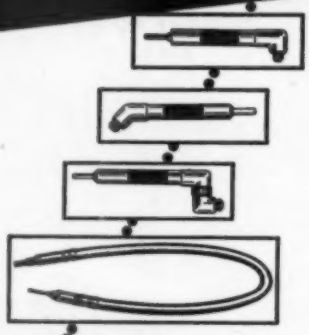

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MOH	28
NEA	24
OZA	27
PAI	24
SOU	24-26
SWA	27-28
TPA	28
TTA	23
WCA	24
WAL	22

*Only airlines using more than standard 21 seats shown.

DOUGLAS DC-4

CAP	55
EAL	60-68
NWA	42-50
PAA-ALA	20
-ATL	60
-LAD	55
Panagra	56
TWA	70
UAL	64
WAL	66

DOUGLAS DC-6

AA	58-80
BNF	52-62
DAL	76
NAL	60
PAA-LAD	62
UAL	50-72

DOUGLAS DC-6B

AA	58-66
CAL	64-66
NAL	94
NWA	44-76
PAA-ATL	49-75
-LAD	54-89
Panagra	70
UAL	58-75
WAL	60-66

DOUGLAS DC-7

AA	63-89
BNF	62
EAL	68
NAL	69
PAA-ATL	54-75*
-ATL	55-77**
-LAD	60
Panagra	58
UAL	54-58

*DC-7B **DC-7C

CONVAIR 240/340

All	40-44

LOCKHEED L-49

BNF	54
CAP	56
DAL	72
PAA-LAD	66
TWA	81

LOCKHEED L-1049/1049C

EAL	88
TWA	71

LOCKHEED L-1049G

EAL	70-88
NWA	69-74
TWA	64-78

BOEING 377

NWA	83
PAA-ATL	43-81

MARTIN 2-0-2/4-0-4

AAA, SWA	36-44
EAL	40
TWA	36-40

How 1,000,000 Southwesterners saw the world

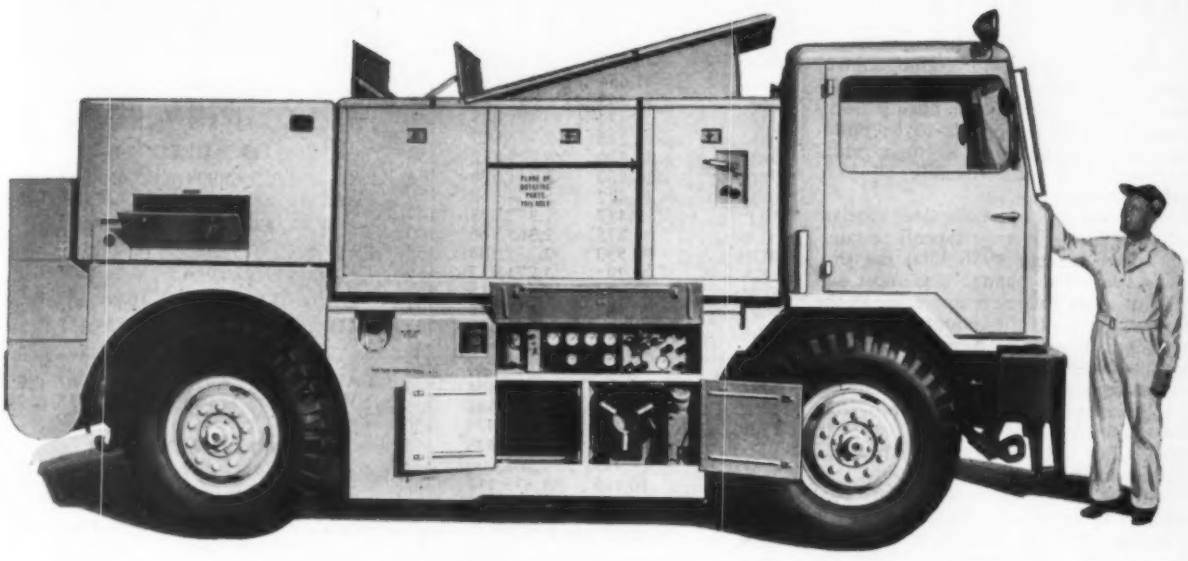
By May 1,000,000 passengers will have traveled from the growing, air-minded cities of the Southwest to places all over the world. For *all-the-way* air service, the Southwest travels on TTA, *thanks to the trunk airlines' excellent cooperation and service.*

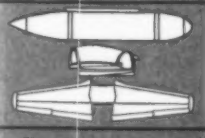
TTA

TRANS-TEXAS AIRWAYS

SERVING OVER 50 CITIES IN TEXAS, LOUISIANA, ARKANSAS, & TENNESSEE

CAPABILITIES . . . Manpower, Tools and Experience



BEECH BUILDS	
	MA-3 MULTI-PURPOSE VEHICLES
	C-26, MD-3 POWER UNITS
	TANK-WING-MAJOR SUBASSEMBLY SUBCONTRACT PRODUCTION
	BEECHCRAFT T-34 TRAINERS
	BEECHCRAFT L-23 TRANSPORTS
	4-PLACE BEECHCRAFT BONANZA
	6-PLACE BEECHCRAFT TWIN-BONANZA
	8-PLACE BEECHCRAFT SUPER 18

No other ground support unit offers the complete flexibility and "fast starting" action of the Beechcraft MA-3 Multi-Purpose Vehicle, now entering service with the U. S. Air Force.

The MA-3 has 12,500 pounds draw-bar pull for towing aircraft, which can be increased by adding to its gross weight. It has reciprocating and gas turbine power plants, an air cycle type air-conditioner of 13-ton capacity, high pressure air compressor with capacity of 15 CFM of free air at pressures up to 3500 PSI. The vehicle can travel at 45 mph, maneuvers easily, has four-wheel power steering, four-wheel drive and four-speed torque converter transmission (four speeds forward and two reverse).

The MA-3 provides 28 Kilowatts direct current from two self-cooled 500 ampere 28-volt generators; features split and single bus; has three-phase alternating current 60 KVA-45 KW; and a self-cooled alternator, precisely controlled frequency 400 CPS.

Unexcelled in-the-field service by thousands of Beechcraft ground power units and a world-wide service organization add to the advantages of this truly exceptional unit.

Inquiries from airlines, manufacturers, and others who desire details of the most advanced and modern ground support unit will be welcomed by the Contract Administration Division, Beech Aircraft Corporation, Wichita 1, Kansas.

Beechcraft

BEECH AIRCRAFT CORPORATION, WICHITA, KANSAS, U. S. A.

ATC snarl cuts aircraft speeds

The mounting air traffic control bottleneck, taking a greater toll of airline on-time operations during 1956 than ever before, appears to be building an additional one to three mile-per-hour drag into virtually all U.S. airline transports.

Almost without exception, carriers achieved lower average takeoff to landing speeds during 1956 than the previous year. The change was most significant among carriers operating in the eastern part of the country in such high-density areas as New York, Washington and Boston.

Allegheny Airlines, for example, saw its average DC-3 speed drop from 140 mph in 1955 to 138 last year. Northeast's DC-3s averaged only 136 mph against 141 the year before.

With airline operating effort continually directed at getting the most in speed out of their aircraft, it is difficult to conceive that anything except the ATC dilemma is the cause. Traffic delays simply add up to more hours in the air with no increase whatever in the revenue mile column.

Some other examples: American Airlines' DC-7s dropped from 306.4 mph to 303; its Convair 240s from 193.7 to 192. TWA's 4-0-4s lost 1.6 mph from 188.6 to 187. National Airlines' DC-7s dropped a full 5 mph from 292 in 1955 to 287 in 1956.

Although an expanding fleet operation could be a factor in some instances, the trend is fairly evident that something more general in nature is the cause. One such example of this is Capital Airlines' Viscount operation where average speeds dropped almost 10 mph from 255.6 in 1955 to only 246 last year, while Capital was continually adding new Viscount schedules throughout the year.

A year to year study of average speeds realized by carriers with what are essentially the same aircraft reveals a wide speed spread. Varying route operations, altitudes dictated by terrain conditions, frequency of stops, etc. all play an important role in raising or lowering these average speeds.

In DC-3 operations by 26 carriers last year, for example, average speeds ranged from a low of 134 mph for West Coast Airlines to a high of 158 mph by Braniff—a 24 mph difference. In feeder airline service the highest speed recorded was 154 mph by Trans Texas Airways.

Here's how individual carriers fared based on total revenue flight hours and total revenue miles operated:

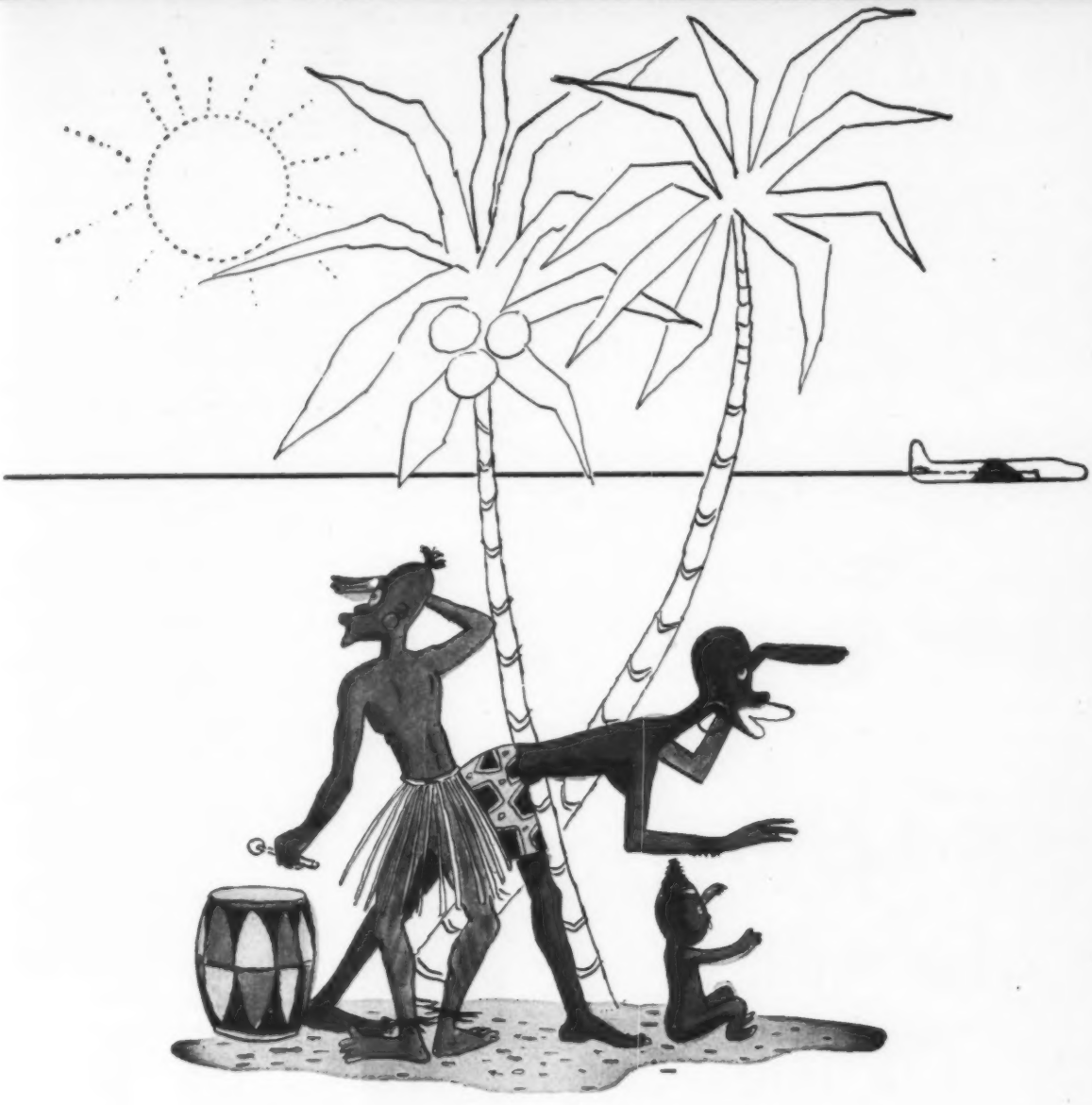
(Takeoff to Landing)

Airline	Revenue Flight Hours	Revenue Miles	Average Speed
AAA	32,256	4,441,940	138
BAL	19,247	2,870,214	149
BNF	46,372	7,324,164	158
CAL	41,654	6,377,389	153
CAP	50,243	6,989,774	139
CBA	6,174	871,423	141
CEN	19,215	2,785,679	145
DAL	38,170	5,715,132	150
EAL	11,860	1,711,596	144
FAL	35,622	5,354,359	150
HAL	9,417	1,380,093	147
LCA	16,875	2,365,966	140
MOH	20,558	2,837,504	138
NEA	29,291	3,971,937	136
NOR	55,651	7,900,015	142
NWA	14,984	2,158,779	144
OZA	36,447	5,225,986	143
PAI	48,144	6,952,278	144
Panagra ..	3,660	576,050	157
SOU	24,328	3,616,354	149
SWA	15,796	2,190,548	139
TPA	11,710	1,755,078	150
TTA	39,204	6,056,996	154
UAL	13,933	1,968,000	141
WAL	10,919	1,675,111	153
WCA	27,118	3,646,541	134
DOUGLAS DC-4			
AA	5,539	1,047,470	189
CAP	44,527	7,793,400	175
EAL	28,844	5,589,353	194
NEA	743	121,959	164
NWA	56,692	10,810,104	191
PAA-ALA	3,037	607,538	200
-ATL	23,317	4,388,282	188
-LAD	33,071	6,862,040	207
-PAC	5,068	980,529	193
Panagra ..	1,388	280,393	202
TWA	19,416	3,640,743	188
UAL	34,098	6,501,000	191
WAL	5,692	1,018,817	179
DOUGLAS DC-6			
AA	157,916	39,728,508	252
BNF	28,769	7,376,332	256
CAL	7,531	1,901,253	252
DAL	28,145	7,096,896	252
NAL	12,396	3,133,558	253
PAA-LAD .	10,875	2,748,911	253
UAL	144,628	36,878,000	255
DOUGLAS DC-6A			
AA	15,405	3,878,761	252
PAA-ATL .	3,174	789,621	249
-LAD .	7,634	2,016,370	264
UAL	6,409	1,670,000	261
DOUGLAS DC-6B			
AA	78,235	19,685,103	252
CAP*	112	23,196	207
NAL	32,218	7,984,146	248
NWA	30,968	8,039,417	260
PAA-ATL .	60,980	15,170,400	249
-LAD .	64,964	16,787,326	258
-PAC .	9,231	2,254,429	244
Panagra ..	7,495	1,903,778	254
UAL	87,023	22,381,000	257
WAL	32,150	7,946,676	247
DOUGLAS DC-7			
AA	108,291	32,862,179	303
DAL	36,331	10,536,653	290
NAL	13,923	3,996,043	287
UAL	95,509	28,991,000	304
DOUGLAS DC-7B			
EAL	51,584	14,544,448	282
NAL*	2,957	826,021	279
PAA-ATL .	23,634	6,554,857	277
-LAD .	3,693	1,122,927	304
Panagra ...	9,132	2,699,055	296
DOUGLAS DC-7C			
BNF	2,317	663,051	286
PAA-ATL .	13,566	3,793,979	280
-PAC .	7,809	2,376,686	304
LOCKHEED L-49			
BNF	4,873	1,135,634	233
CAP	31,861	6,957,909	218
DAL	4,628	1,047,164	226
EAL	71	15,253	215
NAL*	2,490	571,358	229
PAA-LAD .	6,943	1,581,631	228
TWA	111,879	26,249,321	235
LOCKHEED 749			
EAL	65,900	15,655,932	238
TWA	116,162	28,129,442	242
LOCKHEED 1049			
EAL	57,949	14,626,375	252
TWA	26,086	6,842,709	262
LOCKHEED 1049C			
EAL	69,049	17,453,137	253
LOCKHEED 1049G			
EAL	4,589	1,146,737	250
NWA	12,080	3,178,515	263
TWA	77,817	21,078,449	271
LOCKHEED 1049H			
EAL	71	15,253	215
BOEING 377			
NWA	30,181	7,565,714	251
PAA-ALA .	3,543	879,765	248
-ATL .	27,307	6,924,728	254
-PAC .	60,045	15,791,310	263
CONVAIR 240			
AA	188,785	36,165,641	192
MOH	7,326	1,340,944	183
NEA	13,072	2,382,846	182
PAA-LAD .	7,960	1,760,655	221
WAL	20,621	4,210,212	204
CONVAIR 340/440			
BNF	72,683	15,253,905	210
CAP*	154	28,860	187
CAL	24,336	5,160,773	212
DAL	62,138	12,775,764	206
EAL*	3,254	681,143	209
HAL	8,125	1,574,515	194
NAL	35,778	6,953,950	194
UAL	119,562	23,305,000	195
MARTIN 2-0-2/2-0-2A			
AAA	5,854	1,018,935	174
SWA	10,007	1,858,249	186
MARTIN 4-0-4			
EAL	188,905	34,883,796	185
TWA	113,023	21,117,172	187
CURTISS C-46/CW-20T			
BNF	1,899	367,314	193
NEA	789	138,001	175
VICKERS VISCOUNT			
CAP	72,167	17,736,223	246

HELICOPTER OPERATIONS

BELL 47			
CHA	5,832	306,692	53
NYA	145	8,794	61
SIKORSKY S-51			
LAA	1,045	63,934	61
SIKORSKY S-55			
CHA	437	28,137	64
LAA	7,109	488,956	69
NYA	6,644	378,101	57
SIKORSKY S-58			
NYA	852	56,987	67

*Interchange equipment
Source: American Aviation Survey.



Around the equator 1,800,000 times!

Passengers on the scheduled air fleets of the world last year logged 45 billion miles – enough for one passenger to fly around the equator more than one and three-quarter million times. This figure represents a gain of 16% over total passenger miles flown in 1955. And this amazing record is expected to be broken again in 1957.

As more and more people fly more and more miles, new and better planes are being developed to serve them. To keep these planes flying, operators know they can rely on Esso Marketers for the finest in modern aviation fuels and lubricants—perfected through years of research – and for the finest in uniform, safe and efficient petroleum service along the airways of the world.

8 OUT OF 10 OF ALL THE WORLD'S INTERNATIONAL AIRLINES USE

ESSO

AVIATION PRODUCTS

1956 gas & oil consumption

The mounting avgas and oil bill for U.S. scheduled airlines, generally looked upon as the tax bed for an airways user charge, passed the $¼ billion mark in 1956 for the first time.

Expenditures for fuel and oil totaled $261,563,585, up 19.7% from $218.4 million in 1955 and 31% over $199.6 million in 1954.

Fuel gallonage was up 12.3% to 1.38 billion gallons and oil up almost 30% to 17.8 million gallons.

Actual fuel and oil consumption along with combined cost figures for 1956 are tabulated here:

Domestic

Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
American	208,133,038	3,067,358	$ 38,369,345
Braniff	32,543,389	406,747	5,571,586
Capital	64,724,414	416,645	8,920,730
Colonial*	5,138,834	48,403	945,908
Continental	13,336,164	181,311	2,381,914
Delta	52,435,500	666,233	9,503,430
Eastern	175,066,397	2,291,911	30,301,655†
National	36,235,169	375,780	5,820,740
Northeast	6,013,311	67,146	1,157,273
Northwest	42,961,492	470,718	7,748,648
TWA	150,604,370	2,412,538	26,775,857
United	182,197,621	2,425,733	33,252,945
Western	20,734,626	222,633	3,729,882
TOTALS.	990,114,325	13,053,156	$174,479,913

** For year ended May 31, 1956, when Colonial merged with Eastern.*
† For year ended Sept. 30 1956.

International

Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
American	4,276,124	60,690	$ 770,600
Braniff	4,649,137	43,121	1,197,895
Colonial*	933,602	8,604	189,473
Delta	3,371,691	52,855	808,364
Eastern	13,273,392	180,014	2,270,438†
Mackey	615,800	6,302	120,264
National	2,646,097	28,019	470,765
Northwest	14,426,312	183,673	3,513,277
Pan American Atlantic	72,619,677	834,964	17,817,596
Latin Amer.	56,798,650	522,633	11,844,883
Pacific	47,469,290	582,966	10,886,180
Alaskan	5,462,704	67,649	1,248,303
Panagra	9,528,529	138,505	2,841,162
TWA	39,352,017	576,103	9,262,721
United	8,934,612	117,429	1,647,623
TOTALS.	284,357,634	3,403,527	$ 64,889,544

** For year ended May 31, 1956, when Colonial merged with Eastern.*
† For year ended Sept. 30 1956.

Territorial

Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
Alaska	3,434,099	42,677	$ 908,477
Alaska Coast.	486,398	4,884	130,688
Byers*	18,985	942	12,120
Caribbean	623,807	6,342	132,641
Cordova	N.A.	N.A.	221,725
Ellis	297,186	3,106	81,919
Hawaiian	2,710,867	39,023	527,962†
N. Consol.	756,819	7,701	317,747
Pac. North.	5,070,508	53,076	1,149,822
Reeve	412,470	5,244	128,967
Wien Alaska	N.A.	N.A.	947,704
TOTALS.	13,811,139	162,995	$ 4,559,772

** For year ended June 30, 1956, when Byers merged with Wien Alaska.*
† For year ended Sept. 30 1956.

Local service

Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
Allegheny	4,712,300	70,163	$ 852,075
Bonanza	2,028,059	29,639	381,111
Central	2,166,652	41,524	386,542
Frontier	3,981,560	54,003	770,271
Lake Central	1,792,503	27,263	333,461†
Mohawk	3,846,602	42,117	743,797†
N. Central	5,603,656	48,132	990,633
Ozark	4,141,621	43,785	746,939
Piedmont	5,101,487	69,404	926,119
Southern	2,551,661	34,593	480,753
Southwest	3,798,298	46,332	661,588†
Trans Texas	4,679,967	80,676	808,430
West Coast	2,817,713	30,768	501,668
TOTALS.	47,222,079	618,399	$ 8,583,387

† For year ended Sept. 30 1956.

All-cargo

Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
Aerovias	1,794,336	15,183	$ 574,727†
Flying Tiger	17,867,174	201,634	1,962,246
Riddle	4,831,715	56,561	1,349,329
Seaboard & Western	10,323,379	133,207	1,593,866†
Slick	15,288,049	180,328	3,419,499
TOTALS.	50,104,653	586,913	$ 8,899,667

Helicopters

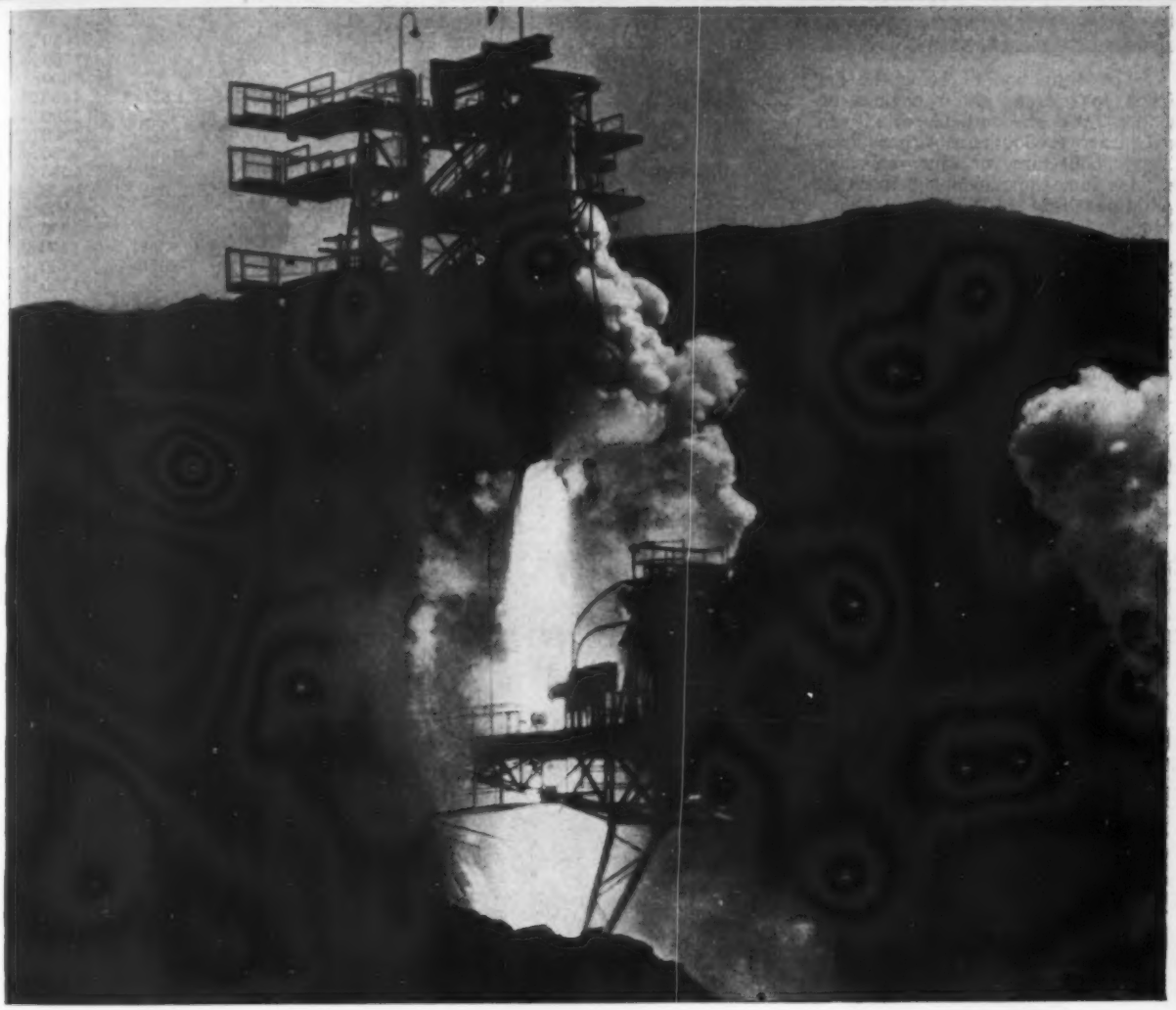
Carrier	Fuel (Gallons)	Oil (Gallons)	Total Cost (Fuel & Oil)
Chi. Helicopter	116,591	1,601	$ 21,490
Los Angeles	354,483	7,266	60,188†
N.Y. Airways	444,516	9,231	69,624†
TOTALS.	915,590	18,098	$ 151,302

† For year ended Sept. 30 1956.

ENGINE OVERHAUL

away with P&W R2800-CB16s and Eastern with R2000s.

CAL	-92	1300
CBA	-67	1050



Powerhouse of America's major missile programs

Every day at ROCKETDYNE's Propulsion Field Laboratory, deep in California's Santa Susana Mountains near Los Angeles, rocket engines developing millions of jet horsepower are tuned and tested for their ultimate job—to power America's long-range missiles.

These high-thrust engines—developing more propulsive power than anything before produced—are moving on schedule from ROCKETDYNE for delivery to the Armed Forces. By fall of this year other high-thrust production engines will flow from another plant now being activated by ROCKETDYNE in Neosho, Missouri.

As today's engines are being delivered, ROCKETDYNE engineers are constantly pushing ahead—evolving dramatic boosts in power outputs and engine performance.

This kind of tomorrow-minded engineering—conducted in a private enterprise system—is a keystone in the defense structure of the free world.

As an engineer, you could find no more challenging and rewarding field than Rocketry. Write: ROCKETDYNE, Personnel Manager, Dept. A-72, 6633 Canoga Avenue, Canoga Park, California or Dept. W-72, Neosho, Mo.

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ENGINE OVERHAUL

The distinction of being the first airline to operate piston engines beyond a 2,000-hr. overhaul period went to Chicago & Southern Airlines (now Delta) about three or four years ago, and for some time it looked like C&S would have that sole distinction permanently.

Engine overhaul period trends in the past two years, however, have changed all that. Today both Eastern and TWA have passed the 2,000 hr. mark on the same Wright 3350 BD series engine that brought C&S to that high mark. United is only 100 hrs. away with P&W R2800-CB16s and Eastern with R2000s.

In close pursuit are Northwest and PAA with 1,800 hrs. on R2000s and American with 1,830 hrs. on R2800s.

On the BD-1 engines, EAL's current overhaul period is 2,125 hrs., that of TWA an even 2,000.

Complete tabulation of periods used by all airlines on various models follows:

Airline	Model	Time (Hrs.)
P&W R1830		
AAA	-92	1200
BAL	-65,-90D	1200
BNF	-92,-90D	1250
CAL	-92	1300
CBA	-67	1050
CEN	-90D	1200
FAL	-92	1000
HAL	S1C3G	1400
LCA	-90D	1200
NEA	-92	1300
NWA	S1C3G	1200
OZA	-92	1200
PAI	-92	1300
SOU	-90D	1300
SWA	-92	1200
TPA	-92	1200
TTA	-90D	1300
WAL	-92	1200
WCA	-65,-90D	1350
P&W R2000		
AA	-13G	1430
CAP	-7M2	1600
EAL	-D5	1900
	-M2	1600
NWA	-13G	1700
PAA-ATL	-9M1, M3	1800
-PAC	-D5	1800
TWA	-9	1600
UAL	-11C	1500
WAL	-11M3	1200
P&W R2800		
AAA	-85	1200
AA	-83AM4	1530
	-83AM7,CB16/17	1830
BNF	-83AM5,CB16	1400
CAL	-CB16	1500
DAL	-CB16/17	1600
EAL	-CB3	1700
HAL	-CB3	1500
MOH	-CA3/CA18	1200
NAL	-CB16/17	1500
NEA	-CA3,CB3,CB16	1400
NWA	-CB16/17	1600
PAA-ATL	-CB16/17	1500
SWA	-CA18	1200
TWA	-CB16	1600
UAL	-CB16*	1100
	-CB16**	1900
	-CB16***	1500
	-CB17	1200
*Convair	**DC-6 ***DC-6B	
P&W R4360		
PAA-ATL	-B6	1400
-PAC	-B6	1400
NWA	-CB2	1300
WRIGHT R1820		
CAP	G200	1600
DAL	G202A	1500
EAL	G202A	1625
MOH	G202A	1400
NAL	G202	1450
NOR	G202A	1300
WRIGHT R3350		
BNF	BA3	1000
CAP	BA3	1300
EAL	CB1	1600
	BD1	2125
TWA	BA3	1300
	CB1	1400
	BD1	2000
WRIGHT TURBO COMPOUND		
AA	DA2,4	1230
BNF	EA1	1000
DAL	DA2,4	1200
EAL	EA1,3	1000
	DA1	1200
	DA4	1300
NAL	DA2	1100
PAA-ATL	EA1	1000
	DA4	1100
-PAC	EA1	1400
TWA	DA3	1000
UAL	DA2,4	1000
NWA	DA3	1300
TURBOPROPS		
CAP	RRDart	1400

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Even the most experienced traveler finds something new to talk about in South America

Cuzco, Peru, was capital of the amazing Inca Empire's early civilization. This cathedral is built on a foundation of artistic Inca stonework. Young man with horn, at top, is calling townfolk to church.

And the friendliest continent of them all is only overnight from the U.S.A. by Panagra DC-7

No matter where else you've been, you have yet to see such exotic variety. Quaint Spanish architecture next door to fine modern hotels. Flowered cities flanked by the grandeur of the Andes. Gay casinos. 50¢ steak. Restful resorts where you take a holiday from high prices.

Lowest fares ever! 30% off regular fares brings South America within reach of everyone. On 28-day *Pan Am Holiday* #703 you visit six Latin countries for only $923.40 from New York. Your flights, hotel rooms, local sightseeing are all included. You travel on swift *El Pacifico* DC-6Bs, daily all-tourist service. You can also get the 30% discount on deluxe *El InterAmericano* DC-7s; radar for smooth flight day and night . . . famous Red Carpet service New York to Buenos Aires. Both *El InterAmericano* and *El Pacifico* fly daily over the routes of National Airlines, PAA and Panagra. See your Travel Agent or Pan American, U.S. Sales Agent for—

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CREW EMPLOYMENT

Carrier	Pilots & Copilots	Flight Engineers	Cabin Attendants	Total	Avg. Annual Utilization
AAA	120		43	163	808
AA	1,524	491	1,242	3,267	917
BAL	51		25	76	754
BNF	392	54	262	708	814
CAL	192	9	112	313	900
CAP	722	44	497	1,263	780
CBA	23		10	33	771
CEN	64		34	98	641
DAL	536		317	853	963
EAL	1,512	436	1,222	3,170	924
FAL	98		55	153	
HAL	54		23	77	800
LCA	48		26	74	
MOH	90		50	140	
NAL	361	93	254	708	618
NEA	138		64	202	748
NOR	145		80	225	931
NWA	430	97	354	881	972
OZA	109		55	164	960
PAA-ATL	736	343	434	1,513	
-LAD	449	125	314	888	958
-PAC	301	165	326	792	790
Panagra	104		79	183	
PAI	141		57	198	
SOU	66		33	99	783
SWA	71		31	102	726
TPA	25		13	38	814
TTA	112		56	168	847
TWA	1,555	548	1,299	3,402	779
UAL	1,472	527	1,024	3,023	688
WAL	229	57	171	457	613
WCA	76		34	110	
TOTAL	11,946	2,989	8,596	23,541	20,299
Helicopter Operations					
CHA	12			12	
LAA	20			20	
NYA	20			20	

FACILITIES

General Electric's Heavy Military Electronic Equipment Department has leased 100,000 sq. ft. of floor space in Utica, N. Y. Department headquarters are at Syracuse.

Huck Manufacturing Co. has established a west coast branch at Englewood, Calif. for warehousing and servicing company's line of blind rivet and lock-bolt type fasteners.

Cannon Electric Co. has moved its Connecticut facility from East Haven to Salem, Mass.

Bendix Aviation Corp's Computer Division has opened a regional office at 919 N. Michigan Ave., Chicago.

United States Chemical Milling Corp. will establish three regional facilities. First will open in Dallas—Ft. Worth area. Others are scheduled in east coast and midwest areas.

Anadite, Inc. opened a plant April 1 at Hurst, Texas, to service missile, aviation, electronics and other industries with metal finishing work.

Coleman Engineering, Inc., is purchasing 100% of stock of Photographics Products, Inc., Anaheim, Calif., which will become wholly-owned subsidiary.

El-Tronics, Inc., has purchased Warren Plastics Corp. and its subsidiary Cropp Engineering Division, Warren, Pa.

General Electric's Silicone Products Department has announced construction of a new product and development laboratory at Waterford, N. Y. Occupancy is slated for January 1958.

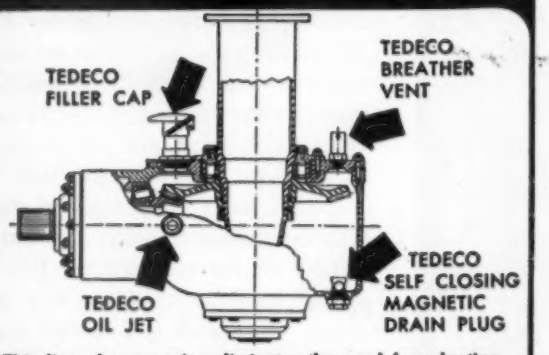
General Scientific Equipment Co. has moved to larger quarters at 7516 Limekiln Pike, Philadelphia.

Kama Instrument Corp., Mineola, L. I. will become a wholly-owned subsidiary of Narda Corp., also of Mineola.

Allison Division, General Motors Corp. has opened a Burbank facility to support Lockheed's Electra test and development program. Facility will do minor overhaul on Allison 501 turboprop engine and assembly and repairs on Aeroproducts 606 propellers.

Callery Chemical Co. has broken ground for a $38-million high energy fuel plant at Muskogee, Okla.

GEAR CASE ACCESSORIES DESIGNED FOR AIRCRAFT



This line of accessories eliminates the need for adapting general manufacturers' equipment to aircraft requirements. Tedeco Gear Case Accessories are designed and manufactured with careful consideration for material strength, for safety of flight, for weight saving, and for military and aeronautical specifications. Used extensively by major aircraft manufacturers on military and commercial equipment.

MAGNETIC DRAIN PLUGS (Both self-closing or conventional)
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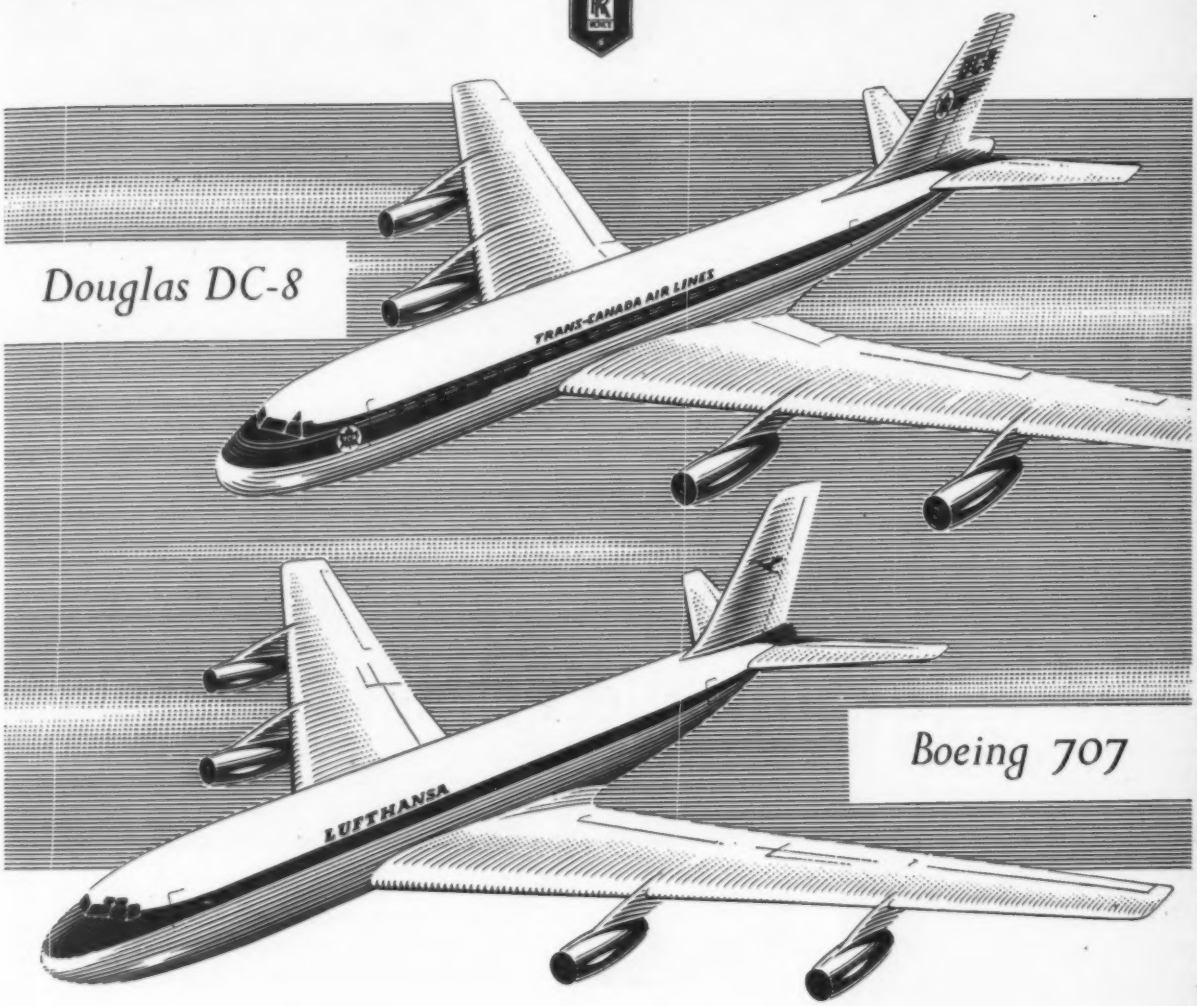
West Coast Airlines – first in scheduled flight among the nations' 13 local service airlines – has begun its second decade of service to the burgeoning Pacific Northwest.

Soon, West Coast Airlines will again pioneer a new era in local service. The first F-27 turbo-prop aircraft to be delivered to a local service airline will go to WCA.

The local service airline industry has come of age in the vital Pacific Northwest.

"Serving Paul Bunyan's Empire"

WEST COAST AIRLINES



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If you use the aircraft of the types mentioned above, by all means learn about RCA's AVQ-50 Weather Avoidance Radar.

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Trade(s) ®

Jet instrumentation development lagging

by Henry P. Steier

THE PACE OF PLANNING for readiness when the jet transports arrive is everywhere quickening except in one area where speed would do the most good.

The area: development to operational status of electronic instrumentation that would permit the jets to shorten the load-to-unload travel times now current.

Prospects for 1960, when the jet transport age dawns, is that the planes will carry the same basic navigation-communication electronics gear that transport aircraft have carried during the past 5-10 years. Edward P. Curtis, presidential assistant for aviation facilities planning, has said, bluntly:

"The successful evolution of a modern ATC system is dependent, among other things, upon successful evolution of the appropriate instrumentation both ground and air."

Among the proposals to be included in Curtis' first official report will be one calling for a National Flight Systems Experimentation Facility.

Recently a member of the Curtis team estimated the facility would cost $25-50 million. (AMERICAN AVIATION, April 8). Its "Manhattan Project" scope would include airfields, reserved airspace, hundreds of engineers and aircraft, and laboratories. Military, civil transport and general aircraft needs would be studied as an integrated effort.

These are some of the things such a facility would do:

Anticipate concepts and numerical data for solution of high-density multiple terminal area problems.

Determine the relative effectiveness of beaconry and data-link techniques.

Determine requirements for compatible instrument landing systems.

Determine relative effectiveness of beaconry and data-link techniques.

Determine the value of automatic altitude-recording and correction techniques.

Develop high-speed runway terminal strips and instrument ground guidance for control on the strips.

Give operational practice with three-dimensional radar concepts.

Give realistic conditions for separating controlled from non-controlled aircraft.

Allow practice flying with close spacing using instruments.

Test handling of air operations under military alert conditions.

Basically this plan is little different from what CAA's Technical Development Center at Indianapolis, Ind., has been trying to carry out for years.

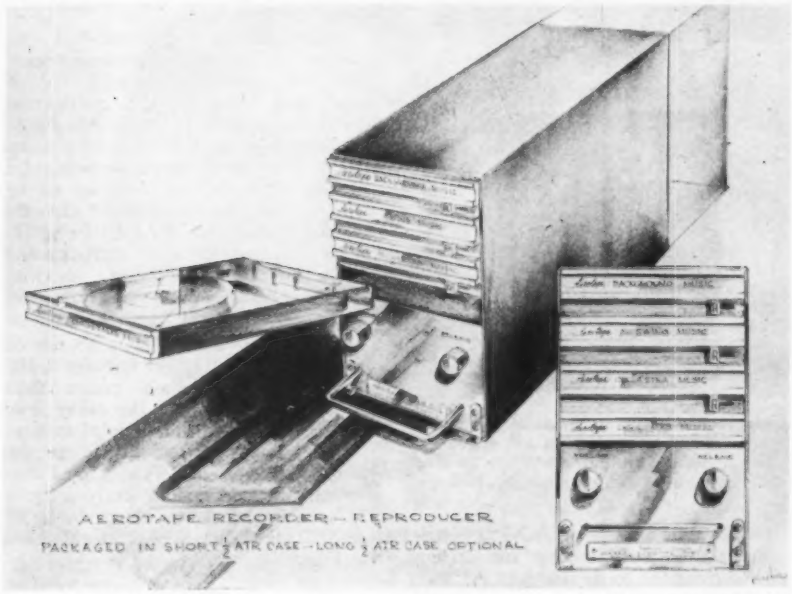
The difference is in the projected scope and budget suggested for the national facility. It would have the means to look years ahead for solutions. Most important of all, it could get aviation facilities planning in line with an important trend in mid-century technology.

This technology calls for reduction of the traditional 10-year gap between research and application of new ideas. Military leaders all agree that a reduction of this time factor is of critical importance to national defense.

Thus far CAA's limited facility at Indianapolis has been forced to use "jerry-rigged" equipment to put out current ATC "fires" rather than look years ahead.

Research - to - application time is being shortened but the gains are not going to meet military jet age needs for more efficient mission performance.

Many of the same needs exist for the mission of jet transport—shortened travel time. However, the perplexing problem of balancing military security requirements against the public service —air travel—remains.



ONE PLEASURE of jet transport age will be music that is audible under quiet jet conditions. General Avionics, Inc. is working to incorporate its novel plug-in-tape reproducer in a radio rack case.

Self-contained aids

One of the most controversial subjects in civil aviation instrumentation planning has been raised by the quest of some transport operators for some means of improving long-haul point-to-point navigation accuracy and reducing operator workload on such flights.

International and long-haul domestic operators want to get some kind of self-contained nav-aids in new jets to be delivered in 1959-60. They want to get the equipment installed before the planes are operational—not after the time when major modifications might be needed.

At the first meeting of the Airlines Electronic Engineering Committee's self-contained aids subcommittee last October five international carriers said they needed the equipment by January 1958 and also the equipment installation then. Others said delivery was needed in 1960.

At the other end of the interest range were carriers who said: "We don't know. Maybe it will go away if we keep quiet."

In any event, there is the possibility that with an inertial or Doppler type of navigation system much more efficient flight paths and more effective ATC traffic patterns for secure and ex-

← Circle No. 88 on Reader Service Card.

peditious flow of traffic can be obtained.

Military security is hampering extension of this study. The airlines don't know what to ask for and until the airlines know more they cannot ask for specifics.

According to William T. Carnes, AEEC chairman, "It's a complete dilemma. ARINC has had a classified meeting for some of the cleared subcommittee members with military people.

"We wanted to bring out that we are not asking for all military equipment to be declassified, but want a selective declassification of some of the techniques."

There is nothing really new about the principles of Doppler or inertial forces. It is the amalgamation of components, methods and techniques to use these principles that go into successful application of the principles to self-contained navigation aids, for specific military uses.

Doppler navigators are well along in development by such companies as General Electric Co., General Precision Laboratory, Ryan Aeronautical, Sanders Associates and Laboratory for Electronics (AMERICAN AVIATION, Dec. 31).

Companies such as A.C. Spark Plug, American Bosch Arma, Bell Aircraft, Jet Propulsion Laboratory, Federal Telecommunication Laboratories, General Electric, General Precision Laboratory, Kearfott, Litton Industries, Minneapolis-Honeywell, North American Aviation and Sperry Rand Corp. have inertial systems under way. One advanced military aircraft system developed by M-H is reportedly undergoing flight evaluation.

What the airlines want to know is what is the most they can get out of a self-contained system when it is designed to fit their needs.

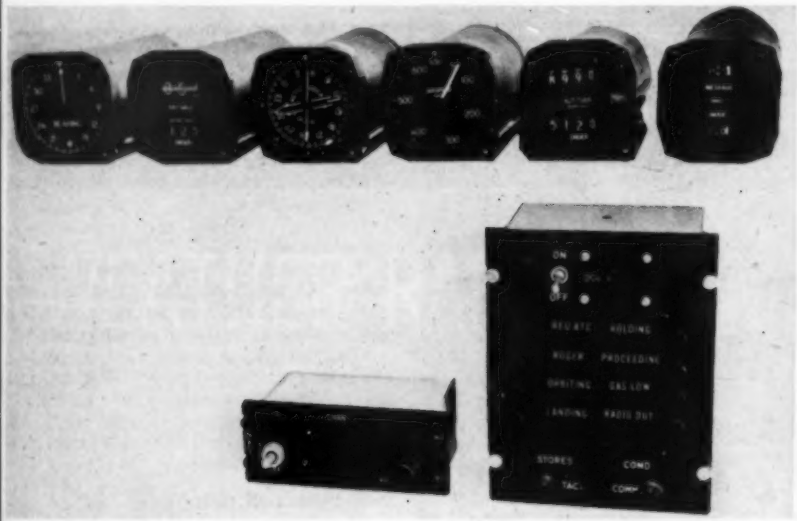
To know this the airlines' planners must know more about the sensing devices such as the accelerometers used in inertial systems.

ARINC members care nothing about the processes used to make the accelerometers. They do want to be able to conclude whether a manufacturer proposing a self-contained aid is presenting a true picture of what can be done.

As things stand the military feels it will be a long time before any declassification can occur. On the other hand some of the manufacturers believe prospects for some declassifications are bright during the coming year, and others do not.

Marconi's Wireless Telegraph Co. has a Doppler navigator under development. Latest word is that the system will be designed to fit standard ARINC form factor cases for possible civil transport application.

Whether this system would find acceptance among U.S. carriers could depend upon how near the possibility is for unified airline navigator specification planning through ARINC.



INSTRUMENTS, message-selector panel and channel selector of Federal Telecommunication Laboratories Tacan data-link. Data on dial indicators is sent automatically to ground. Short pointer on periphery of each dial is set by ground controller to give commands. Message panel contains 31 messages, sent by pushing adjacent buttons.

Communication lags

Some means of reducing the present excessive voice communication workload through automatic reporting has been a forecasted necessity since 1948.

At that time the Radio Technical Commission for Aeronautics Special Committee 31 called for a "private line" or data-link in the ultimate common military-civil system.

The data-link developed by Federal Telecommunication Laboratories for integration with its Tacan system and use by the Navy was recently declassified. It is now being proposed by FTL as the answer to communication needs set forth by SC-31.

The FTL link is now seen as the second step toward realization of an integrated communication-navigation system in which a single receiver-transmitter will handle many of the functions now assigned to separate boxes in civil transport aircraft.

Under development at this time is the third step—integration of glide slope and localizer landing aid function with Tacan. At this time the ILS appears to be in the breadboard stage.

Present design allows exchange of 31 discrete messages between the ground facility and an aircraft. The link permits 120 aircraft to report to one station in less than three seconds.

Information appearing on an aircraft's dial indicator instruments would be automatically sent at regular intervals without need for pilot attention.

For control purposes a ground controller can activate auxiliary indicator needles on the instruments to indicate direction, altitude, speed, etc., commands to the pilot.

Although the Tacan data-link was sponsored by the Navy for carrier operations, the need for common use of certain elements in the U.S. continental air defense system by both Air Force and Navy now requires use of a compatible data-link by those services.

The elements are believed to be parts of the Semi-Automatic Ground Environment system (SAGE) being installed. Navy is now participating heavily in early warning activities through operation of aircraft and blimps carrying long range radars.

In view of the Air Force's use of a data link operating on military UHF communication channels rather than the navigation channel, the Navy now is changing over to that type of system.

The data link for Air Force use was developed by Bell Telephone Laboratories, Inc. A system derived from BTL's basic work is being built by Radio Corporation of America for the Air Force.

Two camps appear to be forming on the question of whether a data link should be operated on the navigation or communication channels.

Some observers point out that if navigation channels are used ground controllers would have no way of knowing to which nav-aid frequency an aircraft was tuned.

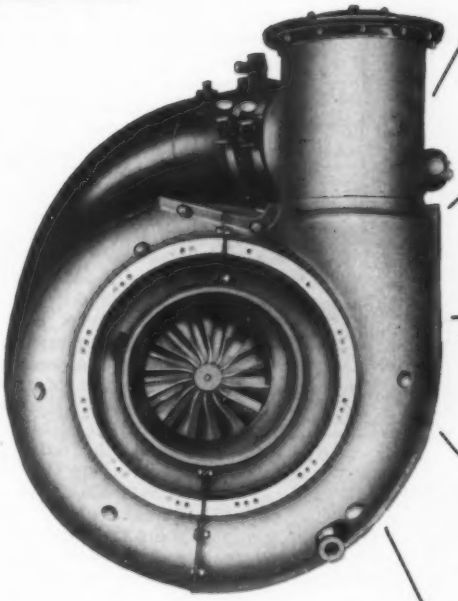
To close this gap complex switching centers would be needed to route signals from Tacan or Vortac stations to control centers and airports.

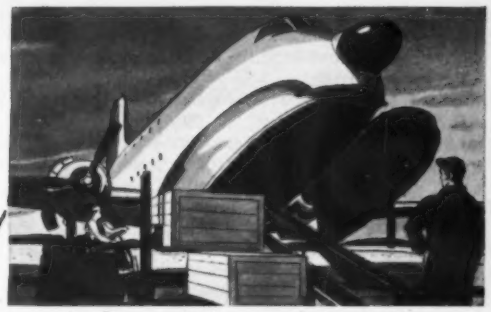
Under present regulations the channels for communicating with these points are set.

On the other side there are engineers who argue that the navigation channel is the logical place for a data link.

A group of civilian engineers at the Rome Air Force Development Center are reportedly working on an

Mars* *is moving fast!*





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Mars engine has proven its worth in more than 15 applications.

Many new uses for the compact, reliable 50 hp Mars gas turbine have been developed in the last few years. Engineers welcome the high power-to-weight ratio of the Mars turbine, its fast starting under extreme temperatures, its easy maintenance, its sturdy dependability with infrequent overhauls. If you need a reliable 50 hp prime mover for pumps, auxiliary electric power or compressors, write Dept. D-25, Solar Aircraft Company, San Diego 12, Calif.

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Circle No. 39 on Reader Service Card.

improved data link using basic Tacan principles.

What the availability of Tacan data link know-how will mean to timing of civil transport adoption and CAA implementation of a data-link system is probably contingent in part upon how soon DMET (distance measuring-Tacan) equipment that suits airline standards become available.

As presently designed the Tacan data link requires 163 subminiature tubes. The airlines have been violently opposed to subminiature tubes.

This feeling is in line with the traditionally conservative attitude of the airlines toward components not backed by many years of field experience.

Even the miniature tubes in wide use by the airlines have been reduced to a preferred list of limited tube type numbers to assure reliable performance.

The already bulging radio racks of civil transports attest to the growing problem of where to put electronic gear expected during the next decade.

Under these conditions integration of radio functions in a system such as Tacan ought to appear as the long-sought hope for space relief.

However, airline experts questioned about the space gains through Tacan adoption generally reply "What would you take out?"

They contend that items such as glide slope and localizer receivers have already been successfully squeezed into ATR form factors, and communication-navigation boxes have also been reduced in size.

This trend to reduction of case sizes for equipment now commonly used puts these older systems nearly on a par with a Tacan system having DME, azimuth and ILS functions.

New trends

During the past year a new trend in aircraft electronic equipment planning toward reduced sizes and equipment integration came into being as a result of manufacturers' efforts to capture both the transport and business aircraft markets with the same equipment.

The forerunner of this trend was the CANARI equipment developed by Wilcox Electric Co. First details on CANARI were revealed in AMERICAN AVIATION, Dec. 5, 1955, p. 39. Without resorting to any startling new components, Wilcox succeeded in reducing the sizes of its navigation, communication and landing-aid equipment, and arranging for sharing of power supplies on an optional basis, so that space limitations of business aircraft could be met and at the same time meeting ARINC standards for airline use.

Following this pace-setting, Collins Radio Co. and Bendix Radio division Bendix Aviation Corp. have since introduced smaller equipment.

Significantly this was done without resorting to use of transistors to any marked extent. Use of printed wiring and other more efficient use of space has aided the reduction.

Airline observers believe the present reduction is about as far as the industry can go without using transistors, and going to a different form factor than present ATR modules. Some say further reductions might be achieved by going to combined functions in one box.

Lockheed to build assemblies for Electras at Bakersfield

Lockheed Aircraft Corp. has scheduled production of eight different assemblies for its turboprop Electra at its new 68,000-sq.-ft. plant in Bakersfield, Calif.

Assemblies that will be produced in this plant will be forward pressure bulkheads, air-conditioning doors, baggage doors, nose landing-gear doors, emergency exit doors, fuselage access doors and the complete empennage and aft body.

All of these assemblies are delivered by truck to Plant B-5 at Burbank, where the Electra will be assembled. Some of the Electra subassemblies already have been turned out at Bakersfield, but volume production won't begin until after the new plant is fully occupied early in June.

Lockheed has been producing Super Constellation sub-assemblies in its old plant at Bakersfield since 1951.

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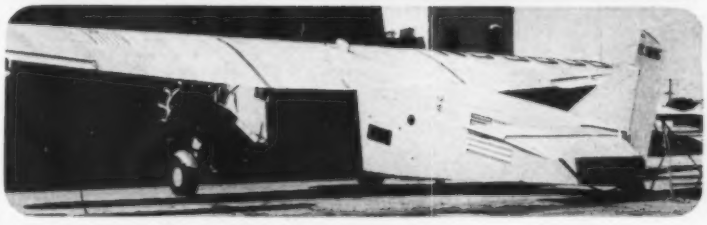
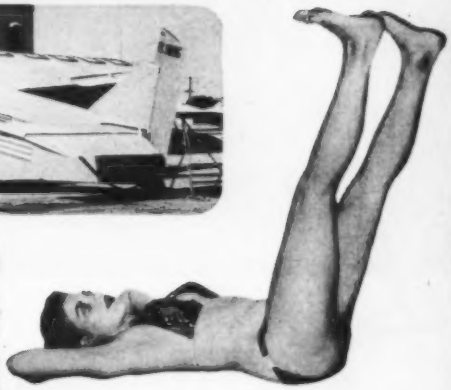
SAC Silver Jubilee Newsreel

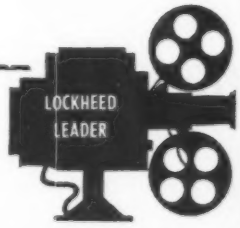
BY JACK PATTON

PLANE PEOPLE
FILLERUP ?
PILOTS ARE TOO SKINNY
WHERE ARE THE PISTONS ?
'36---REFUELLER KILLY KILLINGSWORTH, EX-DIETICIAN LORRAINE SANDERS, ENGINEMAN LOUIS BEIMER START HERE.
AHA---PI OVER X PLUS Y EQUALS SERVICE!
'37 WINSTON CASTLEBERRY JOINED FIRM, RECOMMENDED MORE EMPHASIS ON SERVICE.
CAN YOU BUILD 'EM, TOO ?
DUNNO-NEVER TRIED!
'39-'40..FIRST IN U.S. AS AUTHORIZED LOCKHEED SERVICE STATION.
RECKON IT'LL SPIN?
I'M SICK!
AMONG LOCKHEED 10 OWNERS WAS DOCTOR WHOSE PILOT ALSO CREWED HIS YACHT.

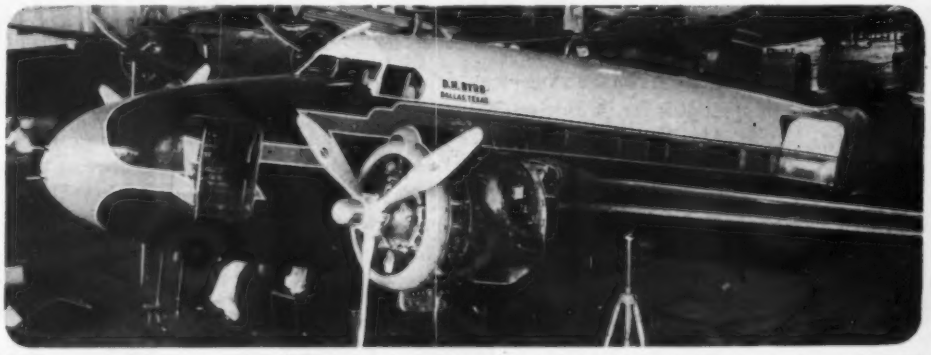
Southwest Airmotive was among the few companies in America providing complete service for business flying's first "big uns", like (top to bottom) the Boeing 247, Tri-Motor Ford, and Sikorsky amphibian.







A look at the records shows that SAC has pioneered more important Lockheed business aircraft modifications than any single firm in America. Besides being tops with other types, we're still No. 1 as a leader in Lockheeds.



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DIVISIONS: KANSAS CITY, KANSAS / DENVER, COLORADO

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QANTAS leaps ahead with LINK 707 jet simulator

Qantas, Australia's overseas airline, has selected Link to build the simulator for its Boeing 707 transports.

Thanks to Link experience and craftsmanship, Qantas 707 crews will log thousands of "flight miles" in the simulator without ever leaving the ground.

Link simulators will provide today's rehearsals for tomorrow's reality in the air. Throughout the world, airline travel will be made safer and more reliable through training in Link equipment.

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GPE

Curtis study shows business flying has best 20-year potential

BUSINESS FLYING SEGMENT of general aviation has the largest growth potential over the next 20 years, top government researchers have determined. The requirements study conducted by special Presidential aide Edward P. Curtis has revealed that airline aircraft will increase very slightly over the present 1,500 in operation and manned military aircraft will begin to decrease.

But general aviation is predicted to have a growth potential of about 50% over the 60,000 present active aircraft. This means the non-carrier aircraft will total about 90,000 units by 1975.

About 90% of the airline fleet will be turboprop and jet, but the next 20 years will continue to see general aviation reliance on the piston engine. Curtis has estimated that about 10 to 15% will be in the turbine class and these operated by the corporations.

Corporations have already moved toward the turboprop and jet. Vickers Viscounts have been delivered for U.S. Steel Corp. executive travel. Fairchild has orders on hand for about 12 executive F-27 turboprops and five M-185 four jet transports.

The nucleus, however, for some time to come will still be the high-performance single engine aircraft and growing stronger, the so-called small twin. The "big four" companies—Beech, Aero Design, Cessna and Piper—have built a total of 3,728 of the twin executive transports ranging from the "Ford of the air"—the Piper Twin Apache—to the supercharged Aero Commanders, Twin Bonanzas, Model 310's and Super Beechcrafts.

CAA has reported that business planes flew a total of 4.3 million hours in 1956 and this figure is expected to double by 1965. In its latest traffic projections, CAA has found that business flying has had a consistent growth since 1946. Total hours between 1946 and 1955 quadrupled with an 84% increase reached in 1947. In the past three years, the hours flown have consistently increased at about 12% each year.

In 1946, CAA reported a total of 1,068,000 hours flown for business. Future projections are that it will hit 5,700,000 hours in 1960, about 7,807,000 in 1965 and 9,929,000 hours by 1970.

Business flying currently accounts for 45% of the approximate 10 million hours flown in non-carrier civil aviation. Growth is predicted at 50% of the projected 15 million hours in 1965 and probably higher by the 1970 prediction date.

The "pure" business fleet is currently estimated at about 25,000 aircraft with 10% in the multi-engine transport category. CAA, however, has reported that of the total 60,000 active aircraft, about 36,000 have engaged in some business flying in the past year.

CAA has placed increased importance on business aircraft lease programs. For the first time, aircraft leasing was given prominent position in its forecasting. Leasing of aircraft is still in the infant stage, but is expected to play a vital role in future operations.

Significantly, business aviation instrument flying is increasing as hours flown rises. In 1956, a total of 68,900 instrument approaches were recorded, an increase of 38.6% over the previous year. Business flying now account for 9% of total instrument approaches compared to 7% in 1946.

As instrument flying increases, business aviation will be faced with user charges much as airlines. Commerce and CAA officials have told Congress that all users will be taxed, with general aviation carrying its share of the costs. This will hit hardest at the corporation aircraft group.

Business Flying Hours and Miles Flown, 1946-1970

Calendar Year	Hours (in thousands)			Miles (in thousands)		
	Number	Annual Number	Change %	Number	Annual Number	Change %
1946	1,068	....	....	121,530	....	....
1947	1,966	898	84.1	228.125	106,595	87.7
1948	2,576	610	31.0	298,945	70,820	31.0
1949	2,615	39	1.5	309,062	10,117	3.4
1950[1]	2,750	135	5.2	339,700	30,638	9.9
1951	2,950	200	7.3	379,845	40,145	11.8
1952	3,124	174	7.9	419,705	39,860	10.5
1953	3,626	502	16.1	499,166	79,461	18.9
1954	3,875	249	6.9	552,610	53,444	10.7
1955 (preliminary)	4,300	425	11.0	614,900	62,290	11.3
1960 (estimated)	5,700	....	....	997,500	....	....
1965 (estimated)	7,807	....	....	1,483,300	....	....
1970 (estimated):						
Low	9,000	....	....	1,710,000	....	....
Intermediate	9,929	....	....	1,886,500	....	....
High	11,000	....	....	2,090,000	....	....

[1] Data statistically computed from trend since no formal survey of flying during 1950 was conducted by CAA.

SOURCE: 1946-1954: CAA Annual Survey of Aircraft Use.
1955-1970: CAA Program Planning Office estimates.

Business aircraft sales in 1956, 1955

Manufacturer & Model	1956	1955
Aero Design & Engineering Co.		
560	....	42
560A	52	30
680	102	....
Beech Aircraft Corp.		
Bonanza	460	437
E18s	107	85
D18s	8	1
Twin Bonanza	119	131
Model 45	30	26
Callair		
Model A5A	....	2
Model A4	20	7
Model S1B1	....	2
Cessna Aircraft Co.		
170B	72	448
172	1,419	173
180	530	880
310	223	228
182	983	....
325	2	....
195B	6	1
195	....	15
305	....	1
Champion Aircraft Corp.		
Model 7EC	162	....
Mooney Aircraft, Inc.		
Mark 20	70	9
Model M18C	9	32
Piper Aircraft Corp.		
Super Cub	727	605
Pacer/Tri-Pacer	1,163	974
Apache	439	291
Taylorcraft, Inc.		
Model 20	35	10
Tourist 15A	....	4
TOTAL	6,738	4,434

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U.S. BUSINESS AIRCRAFT

Manufacturer and Type	WEIGHT Gross, Empty	ENGINES Number Manufact. Type T.O. Power	PERFORMANCE Rate of Climb	Rate of Climb (one engine out)	Cruise Speed	Stall Speed	Range	CAPACITY Fuel	Payload	Volume Main Cabin	Volume Auxiliary Compartments	Volume Under Floor Cargo Hold	Seats	LOADING Wing, Power	SIZE Span Length Height	Remarks
	LBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft & In	
AERO DESIGN																
520 (YL26)	5,500 3,800	2 Lycoming GO-435-C2 260	1,800	400	197	60	1,150	145	1,700	162	32	....	5-7	22.5 11.2	44' 34' 2½" 14' 4½"	150 built 1951-54
560 (YL26A)	6,000 3,900	2 Lycoming GO-435-C2 270	1,400	340	197	59	1,050	145	2,000	162	32	....	5-7	34.7 11.1	44' 34' 2½" 14' 6"	80 built 1954-55
560A (L26B)	6,000 4,198	2 Lycoming GO-48-DIA 275	1,400	250	200	67	1,050	156	1,802	177	32	....	5-7	24.7 10.9	44' 35' 5" 14' 6"	100 built 1955-57
560-E	6,500 4,300	2 Lycoming GO-480 C1B6 295	1,450	300	210	66	1,625	223	2,200	177	32	....	5-7	25.5 11.02	49' 35' 5" 14' 6"	1 built production started March 1957
680 Super L26C	7,000 4,330	2 Lycoming G-SO-480 A1A-6 340	1,600	310	230	71	1,625	223	2,770	177	32	....	5-7	28.8 10.3	44' 35' 5" 14' 6"	202 built since Jan. 1956
BEECH																
E18S	9,300 6,050	2 P&W R985 450	1,350	320	215 66.7% NRP	....	1,762	318	2,399	190	24	....	8	25.75 10.32	49' 8" 35' 2½" 9' 6"	242 built since 1953
D18S	8,750 5,770	2 P&W R985 450	1,190	225	211 75% NRP	....	1,553	286	2,129	190	....	....	8	25.07 10.92	47' 8" 34' 3" 9' 2"	1,027 built since 1937
E-50	7,000 4,440	2 Lycoming GSO-480 340	1,620	245	235 70% NRP	80	1,650	230	1,886	115	55	....	6	25.2 10.9	45' 3⅜" 31' 6½" 11' 4"	393 built since 1949
D-50	6,300 4,070	2 Lycoming GO-480 295	1,450	300	203 70% NRP	71	1,650	180	1,625	115	55	....	6	22.74 11.05	45' 3⅜" 31' 6½" 11' 4"	
H-35 Bonanza	2,900 1,833	1 Continental O-470-G 240	1,250	....	196 75% NRP	57	1,170	57	907	72	16.5	....	4	16.3 12.1	32' 10" 25' 2" 6' 6½"	5,000 built since 1945
95	4,000 2,546	2 Lycoming O-360 180	1,330	....	200 75% NRP	66	1,370	114	1,226	72	16.5	....	4	20.8 11.1	37' 9" 25' 3⅛" 9' 6"	1 built. Production began August 1956
CESSNA																
620	15,000 10,000	4 Continental GSO-526-A 350	1,150	....	260	89	1,700	535	5,000	530.7	130.8	16	11	44.1 10.7	55' 41' 6" 16' 5"	1 prototype built. Production slated for 1958
310	4,600 2,900	2 Continental O-470-M 240	1,700	380	205+ 70% NRP	69	875	100	1,700	....	....	....	5	26.2 9.6	36' 27' 10' 6"	More than 500 built since 1954
172	2,200 1,260	1 Continental O-300-A 145	660	....	124 70% NRP	52	519	42	940	55	120 lbs.	....	4	12.6 15.2	36' 25' 8' 6"	1,834 built since 1955
180	2,650 1,555	1 Continental O-470-K 230	1,130	....	161 71% NRP	56	675	65	1,095	55	120 lbs.	....	4	15.1 11.5	36' 26' 7' 6"	2,889 built since 1953
182	2,650 1,560	1 Continental O-470-L 230	1,030	....	155 71% NRP	56	655	65	1,090	55	120 lbs.	....	4	15.1 11.5	36' 26' 8' 6"	1,261 built since Jan. 1956
PIPER																
PA-18 Super Cub	1,750 930	1 Lycoming 0320 150	960	....	115 75% NRP	43	460	36	596	NA	NA	NA	2	10 11.6	35' 2½" 22' 7" 6' 7 9/16"	3,751 built since 1949
PA-22 Tri-Pacer	2,000 1,100	1 Lycoming 0320 150	725	....	132 75% NRP	49	492	36	668	NA	NA	NA	4	15.4 13.3	29' 4" 20' 7" 8' 4"	5,224 built since 1951
PA-23 Apache	3,500 2,180	2 Lycoming 0320 150	1,350	240	170 75% NRP	52	650	72	856	NA	NA	NA	4 or 5	17.2 11.6	37' 27' 1" 9' 6"	1,033 built since 1954
PA-24 Comanche	2,550 1,450	2 Lycoming 0360-A-1A 180	NA	NA	NA	NA	880	50	785	NA	NA	NA	4	14.3 14.2	35' 10" 24' 9" 7' 4"	2 built in 1950

AIRLINES OF THE WORLD

NORTH AMERICA

AAXICO Airlines, Inc. Int'l Airport, P. O. Box 875, Miami 48, Fla. Equipment: 32 C-46s.

Aerovias Sud Americana, Inc. (ASA International Airlines). Pinellas Int'l Airport, St. Petersburg, Fla. Equipment: 6 C-46s.

Alaska Airlines, Inc. General Offices: 2320 Sixth Ave., Seattle, Wash. Equipment: DC-4s; DC-3s; C-46s; single-engine ski & float equipment. On Order: 2 DC-6Bs.

Alaska Coastal Airlines. 2 Marine Way, Juneau, Alaska. Equipment: 1 Catalina; 9 Grumman G-21As; 1 Lockheed Vega; 1 Bellanca; 3 Piper Pacers; 1 Cessna 195; 1 Hiller H-12C Helicopter.

Allegheny Airlines, Inc. Washington National Airport, Hangar No. 12, Washington 1, D. C. Equipment: 15 DC-3s (1 leased); 5 Martin 202s.

American Airlines, Inc. 100 Park Ave., New York 17, N. Y. Equipment: 39 DC-7s; 25 DC-6Bs; 50 DC-6s; 73 Convairs; 7 DC-6As; 2 DC-4s. On order: 3 DC-6As: 19 DC-7s; 35 Lockheed Electras; 30 Boeing 707s.

Bonanza Air Lines, Inc. P. O. Box 391, McCarran Field, Las Vegas, Nevada. Equipment: 9 DC-3s. On Order: 3 F-27s.

Braniff Airways, Incorporated. Love Field, Dallas 19, Texas. Equipment: 22 DC-3s; 4 DC-7Cs; 9 DC-6s; 25 Convair 340s; 5 Convair 440s; 2 Lockheed 049 Constellations; 2 C-46s; 1 C-47. On Order: 3 DC-7Cs; 5 Boeing 707s; 9 Lockheed Electras.

Capital Airlines, Inc. Washington National Airport, Washington 1, D. C. Equipment: 21 DC-3s; 14 DC-4s; 12 Constellations; 65 Viscounts. On Order: 10 Viscounts; 14 De Havilland Comets.

Caribbean-Atlantic Airlines, Inc. P. O. Box 6035, Loiza Station, Santurce, Puerto Rico. Equipment: 4 DC-3s.

Central Airlines, Inc. Meacham Field, Ft. Worth, Texas. Equipment: 12 DC-3s.

Chicago Helicopter Airways, Inc. 5240 W. 63rd St., Chicago 38, Ill. Equipment: 6 Bell 47-Gs; 3 S-55s. On Order: 3 S-58s.

Christensen Air Service. Anchorage, Alaska. Equipment: 1 J4F2-Grumman Widgeon.

Continental Air Lines, Inc. Stapleton Airfield, Denver 7, Colorado. Equipment: 15 DC-3s; 6 CV-340s; 5 DC-6Bs (including two leased); 3 Convair 440s. On Order: 5 DC-7Bs; 15 Viscount 810-Ds; 4 Boeing 707s.

Cordova Airlines. P. O. Box 1499, Anchorage, Alaska. Equipment: 2 DC-3s; 2 C-46s; 2 Cessna 180s; 3 Cessna 170s.

Delta Air Lines, Inc. Atlanta Airport, Atlanta, Georgia. Equipment: 11 DC-7s; 7 DC-6s; 20 Super-Convair 340s; 4 049 Constellations; 5 Convair 440s; 14 DC-3s; 2 C-47s (cargo). On Order: 10 DC-7s; 3 Convair 440s; 8 DC-8s; 10 Convair 880s; 5 C-46s.

Eastern Air Lines, Inc. Eastern Air Lines Building, 10 Rockefeller Plaza, New York 20, N. Y. Equipment: 16 Super C Constellation L1049Cs; 13 Super Constellation L1049s; 18 Constellation L749s; 59 Silver Falcon Martin 404s; 1 C-54 (Cargoliner); 20 DC-7Bs. On Order: 20 DC-8s; 30 DC-7Bs; 40 Lockheed Electras.

Ellis Air Lines. Box 1059, Ketchikan, Alaska. Equipment: 2 Aeronca Sedans (Seaplanes); 1 Cessna 180; 1 Piper Cruiser; 9 Grummans (Amphibians).

The Flying Tiger Line, Inc. Lockheed Air Terminal, Burbank, Calif. Equipment: Own—5 DC-4s; 18 C-46s; 10 1049H Super Constellations; Leased—5 DC-6As; 3 DC4s.

Frontier Airlines, Inc. Stapleton Airfield, Denver 7, Colo. Equipment: 14 DC-3s.

Hawaiian Airlines Ltd. Honolulu Int'l Airport, Hononlulu 17, T. H. Equipment: 4 DC-3s (Viewmaster); 2 DC-3s; 5 CV-340s; 2 DC-3s (Cargo).

Lake Central Airlines, Inc. Weir Cook Municipal Airport, Indianapolis 44, Ind. Equipment: 10 DC-3s.

Los Angeles Airways, Inc. 5901 W. Imperial Highway, Los Angeles 45, Calif. Equipment: 2 Sikorsky S-51s; 5 Sikorsky S-55s.

Mackey Airlines, Inc. Executive Offices: Broward County Int'l Airport, Fort Lauderdale, Fla. Equipment: 4 DC-3s; 3 DC-4s; 2 Grumman G-21s. On Order: 2 Fairchild-Fokker F-27s (delivery 1957).

CANADAIR LTD. has received a contract from the Canadian government to supply an unspecified quantity of CL-44 turboprop transports to the RCAF for delivery starting in 1959. The aircraft will be derived from the CL-28 Argus patrol bomber which itself is an adaptation of the Britannia. Powerplant of the CL-44 will be four Bristol BE 25 Orions.

Mohawk Airlines, Inc. Executive Administration, Sales, Public Relations & Personnel Offices: Oneida County Airport, Utica, N. Y. Equipment: 11 DC-3s; 11 Convair 240s.

National Airlines, Inc. Aviation Building, 3240 N. W. 27th Ave., Miami 42, Fla. Equipment: 4 DC-7s; 8 DC-6Bs; 4 DC-6s; 12 CV-340s; 10 Lockheed Lodestars; 6 CV-440s. On Order: 23 Lockheed Electras; 4 DC-7Bs; 6 DC-8s.

New York Airways, Inc. LaGuardia Airport Station, Flushing 71, N. Y. Equipment: 5 Sikorsky S-55s; 3 Sikorsky S-58s; 1 Bell 47H. On Order: 4 Sikorsky S-58s (on option).

North Central Airlines, Inc. 6201 34th Ave. South Minneapolis 50, Minn. Equipment: 23 DC-3s.

Northeast Airlines, Inc. Logan Int'l Airport, 239 Prescott St., E. Boston 28, Mass. Equipment: 1 DC-6B; 6 Convairs; 12 DC-3s. On Order: 5 Bristol Britannias; 9 DC-6Bs.

Northern Consolidated Airlines, Inc. 414 Fourth Ave., Anchorage, Alaska. Equipment: 4 DC-3s; 12 Cessna T-50s.

Northwest Airlines, Inc. 1885 University Ave., St. Paul 1, Minnesota. Equipment: 9 B-377s; 4 L-1049Gs; 10 DC-6Bs; 18 DC-4s; 6 DC-3s. On Order: 14 DC-7Cs; 8 DC-6Bs.

Ozark Air Lines, Inc. Box 6007, Lambert Field, St. Louis 21, Mo. Equipment: 20 DC-3s.

Pacific Northern Airlines, Inc. Anchorage, Alaska (Mail: 1626 Exchange Bldg., Seattle 4, Wash.). Equipment: 3 Lockheed 749s; 2 DC-4s; 4 DC-3s.

Pan American World Airways, Inc. 135 East 42nd Street, New York 17, N. Y. Equipment: 8 Boeing Stratocruisers; 8 DC-7Cs; 8 DC-4s; 18 DC-6Bs; 1 DC-6A; 3 DC-7Bs; 1 DC-3. Latin American Division Equipment: 4 DC-7Bs; 2 DC-6As; 25 DC-6Bs; 4 DC-6s (leased); 5 CV-240s; 4 DC-4s; 9 DC-4s (cargo); 2 DC-3s; 2 L-49s. Pacific-Alaska Division Equipment: 17 B-337s; 5 DC-4s; 8 DC-7Cs. On Order: 23 Boeing 707s; 25 DC-8s.

Pan American-Grace Airways, Inc. 135 East 42nd Street, New York 17, N. Y. Equipment: 5 DC-7Bs; 5 DC-6Bs; 2 DC-4s; 4 DC-3s.

Piedmont Airlines. Smith Reynolds Airport, Winston-Salem, N. C. Equipment: 20 DC-3s.

Reeve Aleutian Airways, Inc. Box 559, Anchorage, Alaska. Equipment: 2 DC-3s; Sikorsky S-43s; 1 Grumman Goose; 1 DC-4E.

Resort Airlines, Inc. 1346 Connecticut Ave., N. W., Washington 6, D. C. Equipment: 9 DC-4s. On Order: 2 L-1049Hs.

Riddle Airlines, Inc. International Airport, Miami, Fla. (Mail: P. O. Box 535, Int'l Airport Br., Miami 48, Fla.). Equipment: 32 C-46s; 4 DC-4s; 1 DC-6A. On Order: 4 DC-6As.

Safeway Airways. Merrill Field, Anchorage, Alaska. Equipment: Grumman Widgeon; Piper Apache; Pacers; Super Cubs; Stinsons.

Samoan Airlines, Ltd. 1452 Liholiho St., Honolulu, Hawaii. On Order: 2 Frye F-1s. (Not operating).

Seaboard & Western Airlines, Inc. 80 Broad St., New York 4, N. Y. Equipment:

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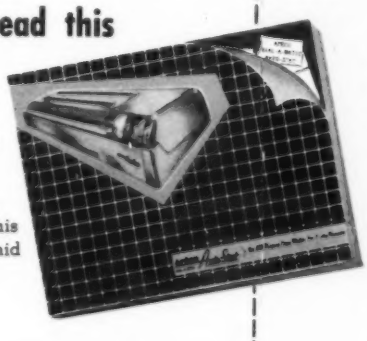

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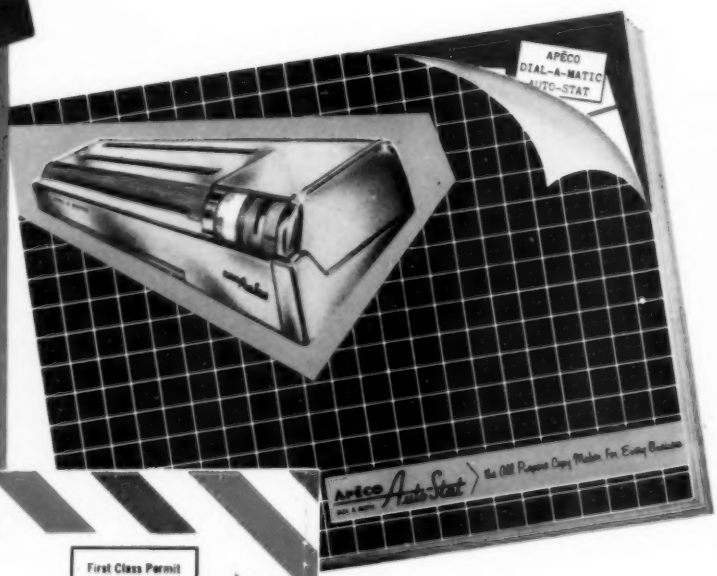

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Slick Airways, Inc. 3415 Cedar Springs, Rd., Dallas, Tex. Equipment: 8 DC-6As; 7 DC-4s; 13 C-46s.

South Pacific Air Lines. 311 California St., San Francisco 4, Calif.

Southern Airways, Inc. Executive Offices: Brown-Marx Bldg., Birmingham, Ala. Equipment: 13 DC-3s.

Southwest Airways Co. San Francisco Int'l Airport, San Francisco, Calif. Equipment: 7 Martin 202s; 10 DC-3s; 1 Lockheed 12A.

Trans World Airlines, Inc. 10 Richards Rd., Kansas City 5, Mo. Equipment: 4 DC-3s; 1 DC-3 (cargo); 2 DC-4s; 8 DC-4s (cargo); 32 Lockheed 049s; 12 Lockheed 749's; 27 Lockheed 749-As; 9 Lockheed 1049's; 28 Lockheed 1049G's; 11 Martin 202-As; 37 Martin 404s; 1 Fairchild C-82. On Order: 25 Lockheed 1649As; 8 Boeing 707-120s; 30 Convair 880s.

Trans-Pacific Airlines, Ltd. (The Aloha Airline). P. O. Box 3769, Honolulu, T. H. Equipment: 8 DC-3s.

Trans-Texas Airways. International Airport, Houston 17, Texas. Equipment: 20 DC-3s.

United Air Lines, Inc. Executive Offices: 5959 S. Cicero Ave., Chicago 38, Illinois. Equipment: 4 C-54s (Air Coach); 3 C-54's (Cargoliners); 14 DC-6s (Mainliners); 24 DC-6Bs (Mainliners); 26 DC-7s (Mainliners); 28 DC-6s (Air Coach); 6 DC-6Bs (Air Coach); 55 Convair 340s (Mainliners); 5 DC-6As (Cargoliners). On Order: 21 DC-7's (Mainliners); 7 DC-6Bs (Mainliners); 30 DC-8s (Mainliners).

Uraba, Medellin & Central Airways, Inc. 135 E. 42nd St., New York, N. Y.

West Coast Airlines, Inc. Boeing Field, Seattle 8, Washington. Equipment: 14 DC-3s.

Western Air Lines, Inc. 6060 Avion Drive (P. O. Box 45005 Airport Station), Los Angeles 45, Calif. Equipment: 5 DC-3s; 2 DC-4s; 9 Convair-Liners; 13 DC-6Bs.

Wien Alaska Airlines, Inc. Box 649, Fairbanks, Alaska. Equipment: 4 C-46s; 3 DC-3s; 6 Noorduyn's; 2 Cessna 195s; 6 Cessna 170s; 1 Cessna 180.

CANADA

Canadian Pacific Air Lines, Ltd. Head Office: Vancouver Airport, B. C. Equipment: Otters; DC-3s; C-46s; Convairs; PBYs; DC-4s; DC-6Bs. On Order: 8 DC-6Bs; 5 Britannias.

Laurentian Air Services, Ltd. P. O. Box 71, Ottawa, Ont. Equipment: 6 Beavers; 1 Cessna 180; 1 Goose.

Leavens Bros. Ltd. Head Office: Barker Airport, Toronto, Ont. Equipment: 31 single-engine aircraft; 5 twin-engine aircraft.

Maritime Central Airways, Ltd. Charlottetown, Prince Edward Island. Equipment: 8 DC-3s; 3 C-46s; 1 PBY; 1 Beaver; 1 York; 4 DC-4s; 3 Beech C-18s.

Northern Wings Ltd. Room 401, 130 St. Jean St., Quebec, P. Q. Equipment: 2 DC-3s; 2 PBYs; 4 Beavers; 3 Norsemen; 1 Anson.

Okanagan Helicopters Ltd. Vancouver Airport, B. C. Equipment: 13 Bell 47DIs; 7 Bell 47Gs; 5 S-55s; S-58s.

Pacific Western Airlines Ltd. Vancouver Airport, B. C. Equipment: 62 aircraft, including Beavers and DC-3s.

Quebecair Inc. Rimouski, P. Q. Equipment: 6 DC-3s; 2 PBYs; 1 Beech 18.

Saskatchewan Government Airways. P. O. Box 850, Prince Albert, Sask. Equipment: 1 DC-3; 4 Norsemen; 4 Beavers; 2 Cessna 140s; 7 Cessna 180s; 1 Cessna 170; 1 Otter.

Transair Ltd. Head Office: No. 5 Hangar, Stevenson Airport, Winnipeg 12, Manitoba. Equipment: 1 DC-4; 1 DC-3; 1 Bristol 170; 2 Yorks; 4 PBYs; 1 Lockheed; 2 Ansons; 16 Norsemen; 3 Beavers; 4 Cessna 180s; 1 Bellanca Airbus.

Trans-Canada Air Lines. Executive Offices: International Aviation Bldg., 1080 University St., Montreal, P. Q. Equipment: 24 DC-3s; 21 North Stars; 9 Super-Constellations; 18 Viscounts. On Order: 20 Viscounts; 6 DC-8s; 20 Vanguards; 2 Super-Constellations.

Wheeler Air Lines, Ltd. St. Jovite Station, Quebec. Equipment: 2 DC-4s; 1 C-46; 3 DC-3s; 2 PBYs; 1 Otter; 2 Beavers; 3 Norsemen; 1 Cessna; 7 Stearman Sprayplanes; 1 Twin-Beech.

EUROPE

AZORES

Sociedade Acoriana de Transportes Aereos, LDa (SATA). Rua dos Mercadores, 7-11, Ponta Delgada. Equipment: Doves.

BELGIUM

Sobelair (Societe Belge de Transports Par Air, S. A.). 137 Rue Royale, Brussels. Equipment: 2 DC-4s.

Sabena Belgian World Airlines. (Societe Anonyme Belge D'Exploitation De La Navigation Aerienne). Air Terminus, Brussels. Equipment: 3 DC-6s; 8 DC-6Bs; 2 DC-6Cs; 3 DC-7Cs; 12 Convair 440s; 7 DC-4s; 4 Convair 240s; 27 DC-3s; 3 Piper Cubs; 2 Tiger Moths; 1 Auster; 5 Safirs; 4 S-58s. On Order: 7 DC-7Cs; 4 S-58s; 4 Boeing 707s.

BULGARIA

Transport Aerien Civil Bulgare (TABSO). 12 Place Narodno, Sabranie, Sofia. Equipment: Li-2s.

CZECHOSLOVAKIA

Ceskoslovenske Aerolinie (Czechoslovak Airlines). 1 Namesti Republiky, Prague. Equipment: DC-3s and Il-12s.

FINLAND

Aero O/Y (Finnair). Mannerheimintie 9B, P. O. Box 278, Helsinki. Equipment: 3 Convair 340s; 1 Convair 440; 10 DC-3s. On Order: 2 Convair 440s.

Karhumaki Airways. Lonnrotinkatu 3, Helsinki. Equipment: 3 DC-3s; 1 Lodestar. On Order: Convair 440.

FRANCE

Bahama Helicopters Ltd. 85 rue Jouffroy, Paris 17e. Equipment: 19 Bell helicopters; 7 Sikorsky helicopters.

Compagnie Nationale Air France. 2 rue Marbeuf, Paris 8°. Equipment: 19 Super Constellations: 17 Constellations: 20 DC-4s; 12 Breguet 763s; 11 Viscounts; 40 DC-3s. On Order: 14 Super Constellations; 12 Caravelles; 17 Boeing 707s.

Transports Aeriens Intercontinentaux (TAI). 23 rue de la Paix, Paris 2°. Equipment: 5 DC-6Bs; 2 DC-4s. On Order: 2 DC-7Cs; 2 DC-8s.

Union Aeromaritime De Transport (UAT). 5 Boulevard Malesherbes, Paris 8°. Equipment: 6 DC-6Bs; 1 DC-6C; 1 DC-4; 8 Herons; 4 Nord 2501s; 1 Oxford Trainer. On Order: 2 DC-6Bs; 2 DC-8s.

GERMANY

(East Germany)

East German Lufthansa. Schonefeld Airport, Berlin. Equipment: Il-14s.

(Federal Republic of Germany)

Deutsche Lufthansa Aktiengesellschaft (Lufthansa). Claudiusstrasse 1, Koeln. Equipment: 8 Super Constellations; 4 Convair 340s; 3 DC-3s; 2 Safirs; 2 Bonanzas. On Order: 4 Super Constellations; 11 Viscount 810s; 5 Convair 440s; 4 Boeing 707s.

Deutsche Lufttransport Gesellschaft m.b.H. Fuhlsbuttel Airport, Hamburg. Equipment: DC-3s.

GIBRALTAR

Gibraltar Airways Ltd. (GIBAIR). Cloister Building, Box 212, Irish Town. Equipment: DC-3s.

GREAT BRITAIN

Air Charter Ltd. 21 Wigmore St., London W.1. Equipment: 2 DC-4s; 7 Bristol 170s. On Order: 3 DC-4s; 6 Avro Tudors.

Air Kruise Ltd. (Trans Channel Airways). Ferryfield Airport, Lydd, Kent. Equipment: 6 DC-3s; 3 Bristol 170s. On Order: 6 Heralds.

Airwork Ltd. Airwork House, 35 Piccadilly, London W.1. Equipment: 4 Hermes; 7 Vikings; 4 Bristol 170s; 12 DC-3s; Consuls; Doves; Austers and other small aircraft.

Aquila Airways (Div. of Britavia Ltd.). 1 Great Cumberland Place, London W.1. Equipment: 4 Solents.

B. K. S. Air Transport, Ltd. 1, Marylebone High St., London W. 1. Equipment: 5 DC-3s; 3 Vikings.

British European Airways Corp. Head Office: Keyline House, South Ruislip, Middlesex. Equipment: 26 Viscounts; 46 DC-3s; 19 Elizabethans; 3 Dragon Rapides; 3 Herons; 6 Helicopters. On Order: 38 Viscount 800s; 20 Vanguards.

British Overseas Airways Corp. (BOAC). London Airport, Hounslow, Middlesex. Equipment: 21 Argonauts; 16 Stratocruisers; 16 Constellations; 4 Yorks. On Order: 33 Britannias; 10 DC-7Cs; 20 Comet 4s; 15 Boeing 707s.

Cambrian Airways Ltd. Cardiff (Rhoose) Airport, Glam. So. Wales. Equipment: 2 DC-3s; 3 Herons; 1 Dove; 1 Dragon Rapide.

Derby Aviation Ltd. Derby Airport, Burnaston, Derby. Equipment: 2 DC-3s; 2 Marathons; 1 Dragon Rapide.

Dragon Airways, Lt. Woolsington Airport, Newcastle-on-Tyne. Equipment: 3 Herons; 1 Viking.

Eagle Airways Ltd. Eagle Aviation Ltd. Marble Arch House, 32-50 Edgeware Rd., London W.2. Equipment: 20 Vikings.

East Anglian Flying Services, Ltd. Airport, Southend-on-Sea, Essex. Equipment: 3 Doves; 3 Dragon Rapides.

Don Everall (Aviation) Ltd. Elmdon Airport, Birmingham. Equipment: 1 DC-3; 3 Dragon Rapides; 1 Messenger; 1 Auster.

Hunting-Clan Air Transport, Ltd. London Airport, Hounslow, Middlesex. Equipment: 3 Viscounts; 9 Vikings; 4 Yorks; 4 DC-3s. On Order: 4 Britannias; 2 DC-6As.

Jersey Airlines. 4 The Parade, Jersey, Channel Islands. Equipment: 3 Dragon Rapides; 7 Herons; 1 Bristol 170.

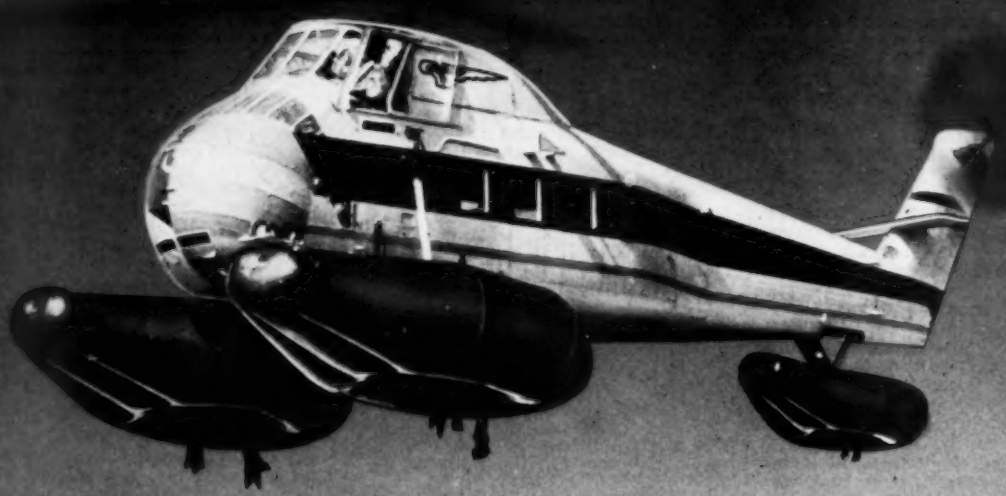
Lancashire Aircraft Corp. Ltd. 7 Berkeley St., London W.1. Equipment: 2 DC-3s; 3 Dragon Rapides; 3 Consuls; 1 Auster; 1 DH 86; 1 Proctor.

Manx Airlines Ltd. Ronaldsway Airport, Isle of Man. Equipment: 6 Bristol 170s; 1 Dragon Rapide. On Order: 3 Herons.

Morton Air Services Ltd. Croydon Airport, Surrey. Equipment: 7 Doves; 3 Consuls; 3 Dragon Rapides.

Olley Air Service Ltd. Main Hall,

Another product of Air Cruisers research



SEA LEGS FOR HELICOPTERS

Whether their requirements for flotation gear are simple or extremely exacting, helicopter manufacturers rely on Air Cruisers' engineering competence and long experience. Typical floats are the donut type shown above which is normally stowed snugly around the landing gear but may inflate in as little as six seconds for emergency landings.

Air Cruisers was the pioneer developer of floats of all types for helicopters. Features are safety, light weight and simple operation. Our inflatable escape slides, life rafts and AD-4 life preservers reflect the same careful research and manufacturing ability.

Every significant development in lightweight inflatable survival equipment for the past 30 years has originated at Air Cruisers. It is this concentration on "survival unlimited" that has made our equipment the standard in both military and commercial airplanes the world over.

Now we have added radiation shielding and lightweight industrial plastics to the products with which we serve industry. As always, they are produced to the highest standards with the most modern techniques and equipment.

Your inquiries are invited.

THE GARRETT CORPORATION

AIR CRUISERS DIVISION

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LIFE JACKETS • LIFE RAFTS • HELICOPTER FLOATS • ESCAPE SLIDES • PACTON INDUSTRIAL PLASTICS • RADIATION SHIELDING

Circle No. 42 on Reader Service Card.

Croydon Airport, Surrey (Controlled by Morton Air Services Ltd.)

Scottish Airlines (Prestwick) Ltd. Prestwick Airport, Ayrshire, Scotland. Equipment: 3 Yorks; 1 DC-3. On Order: 6 Twin Pioneers.

Silver City Airways, Ltd. 11 Great Cumberland Place, London W.1. Equipment: 15 Bristol 170s; 1 Consul; 1 Dragonfly. On Order: 5 Bristol 170s.

Starways Ltd. Liverpool Airport, Liverpool 19. Equipment: 4 DC-3s.

Transair, Ltd. Croydon Airport, Survey. Equipment: 11 DC-3s. On Order: 2 Viscount 800s.

GREECE

TAE National Greek Airlines (Technical and Aeronautical Exploitations Co. Ltd.). 12 Merlin St., Athens. Equipment: 1 DC-4; 14 DC-3s; 1 Fairchild.

HUNGARY

MALEV (Hungarian Air Transport). 5 Vorosmarty-ter, Budapest. Equipment: Li-2s.

ICELAND

Flugfelag Islands, H. F. (Iceland Airways, Ltd.). Laekjargata 4, Reykjavik. Equipment: 4 DC-3s; 2 DC-4s; 2 PBYs; 1 Goose; 1 Dragon Rapide; 1 Norseman; 2 Viscounts. On Order: 2 Electras.

Loftleidir—The Icelandic Airlines. P. O. Box 476, Laekjargata 2, Reykjavik. Equipment: 4 DC-4s.

IRELAND

Aer Lingus TTA (ALT). 43 Upper O'Connell St., Dublin. Equipment: 4 Viscounts; 13 DC-3s. On Order: 3 Viscount 800s; 5 Friendships.

ITALY

Aerolinee Italiane Internazionali (ALITALIA). Via Leonida Bissolati, 20, Rome. Equipment: 6 DC-6Bs; 2 Convair 440s; 4 Convair 340s. On Order: 4 DC-7Cs.

LAI—Linee Aeree Italiane (Italian Airlines). Via Del Tritone, 132, Rome. Equipment: 16 DC-3s; 3 DC-6s; 3 DC-6Bs. On Order: 4 Super Constellations; 10 Viscount 770Ds.

NETHERLANDS

KLM Royal Dutch Airlines (Koninklijke Luchtvaart Maatschappij N. V.). Plesmanweg 1, P. O. Box 121, The Hague. Equipment: 1 Auster; 1 Dragon Rapide; 10 Constellations; 18 Super Constellations; 6 DC-6s; 8 DC-6As; 6 DC-4s; 15 DC-3s; 14 Convair 340s; 7 Convair 240s. On Order: 10 DC-7Cs; 8 DC-8s; 9 Viscount 803s; 2 Friendships; 12 Electras.

NORWAY

Braathens South—American & Far East Airtransport A/S (S.A.F.E.). Fr. Nansens plass 7, Oslo. Equipment: 2 DC-4s; 1 DC-3; 3 Herons. On Order: 3 Friendships.

Fred. Olsen Airtransport Ltd. Fred. Olsens gate 2, Oslo. Equipment: 2 Viscounts; 3 C-46s; 2 DC-3s.

Vestlandske Luftfartseldkap A/S (West Norway Airlines). Trafikikkontor Airport, Bergen. Equipment: 2 Sealands; 2 Seabees; 1 Heron; 1 Piper Cub.

Wideroe's Flyveselskap Og Polarfly A/S. Kr. Augustsgat 19, Oslo. Equipment: 2 Otters; 4 Norsemen. On Order: 2 Otters.

POLAND

Polskie Linie Lotnicze (LOT). Hoza str, 39, Lot Building, Warsaw. Equipment: Li-2s; Il-12s; Il-14s; Aero 45s; CSS 13s.

PORTUGAL

TAP—Transportes Aeros Portugueses, S.A.R.L. 2 Rua Braacamp, Lisbon. Equipment: 3 DC-4s; 6 DC-3s; 3 Super Constellations.

ROMANIA

Transporturi Aeriene Romine (TAROM). Baneasa Airport, Bucharest. Equipment: Li-2s.

SPAIN

Aviacion y Comercio S.A. 33 Calle Aduana, Madrid. Equipment: 5 Languedocs; 5 Bristol 170s. On Order: 8 Herons.

Iberia (Lineas Aereas Espanolas). Avenida de America No. 2, Madrid. Equipment: 5 Super Constellations; 5 Convair 440s; 6 DC-4s; 17 DC-3s; 4 Bristols; 2 JU-52s; 2 Consuls.

SWEDEN

Aero—Nord Sweden AB. Bromma Airport, Stockholm 40, Equipment: 2 Lodestars; 1 Oxford.

Airtaco AB. Bromma Airport, Stockholm 40. Equipment: 4 Lodestars; 4 DC-3s; 1 Lockheed 12A.

Foreningen Ostgotaflyg. c/o Linkopings Flygklubb, Saab, Linkoping. Equipment: 1 Gypsy Moth; 2 Piper Cubs; 1 Safir.

AB Nordisk Aerotjanst (NORDAERO). Kungsangens Flygplats, Norrkoping. Equipment: 1 Stinson Voyager 150.

AB Malmo Flygindustri. Bulltofta Airport, Malmo 12. Equipment: 1 Tipsy; 1 Auster.

Ostermans Aero AB. Stockholm 7. Equipment: 12 Bell 47s; 2 S-55s; 1 Djinn; 4 Seabees; 1 Norseman.

Scandinavian Airlines System. Head Office. Bromma Airport, Stockholm 40. Equipment: 14 DC-6Bs; 12 DC-6s; 8 Scandias; 10 DC-3s; 2 JU-52s; 2 DC-7Cs. On Order: 12 DC-7Cs; 13 Convair 440s; 7 DC-8s.

AB Svenska Aero, K. O. Gustavson. Bromma Airport, Stockholm 40. Equipment: 1 Dragon Rapide. On Order: 1 Dragon Rapide.

SWITZERLAND

Swissair (Swiss Air Transport Co., Ltd.). Hirschengraben 84, P. O. Box 929, Zurich. Equipment: 6 DC-6Bs; 7 Convair 440s; 1 Convair 240; 3 DC-4s; 9 DC-3s; 2 DC-7Cs. On Order: 2 DC-7Cs; 3 DC-8s; 4 Convair 440s.

U.S.S.R.

Aeroflot (Russian Air Lines). Uliza Razina 9. Equipment: Il-12s; Il-14s; Li-2s; Tu-104s.

YUGOSLAVIA

Jugoslovenski Aerotransport (JAT). Bircaninova 1/111, Belgrade. Equipment: 13 DC-3s; 2 Convair 340s.

CENTRAL & SOUTH AMERICA

ARGENTINA

Aerolineas Argentinas. Paseo Colon 185, Buenos Aires. Equipment: 6 DC-6s; 5 DC-4s; 4 Convair 240s; 7 Sandringhams; 16 DC-3s.

Lineas Aereas Del Estado. (LADE). Corrientes 480, Buenos Aires. Equipment: DC-3; Viking; DC-4.

BAHAMA ISLANDS

Bahama Airways, Ltd. (BAL). Oakes Airfield, Nassau. Equipment: 2 Goose; 1 PBY; 3 Herons.

BOLIVIA

Lloyd Aereo Boliviano S. A. (LAB). Casilla 132, Cochabamba. Equipment: 6 B-17s; 2 DC-4s; 11 DC-3s.

BRAZIL

Aerovias Brasil, S. A. (Brazilian International Airlines) (BIA). Rua Conselheiro, Crispiniano 79, Sao Paulo. Equipment: 57 DC-3s; 3 DC-4s; 8 Convairs. On Order: 10 Convair 440s.

Empresa De Transportes Aereos Catarinense, S. A. (T.A.C.). Felipe Schmidt 14, Florianopolis, Santa Catarina. Equipment: DC-3s. On Order: DC-3s.

Empresa De Transportes Aereos Norte Do Brasil S. A. (AERONORTE). Rua Oswaldo Cruz, 341, Sao Luiz, Maranhoa. Equipment: 4 DC-3s.

Loide Aereo Nacional S. A. (LOIDE). Av. 13 de Maio, 13-27° andar, Rio de Janeiro. Equipment: 21 C-46s. On Order: 4 DC-6Cs.

Nacional Transportes Aereos, S. A. Av. Franklin Roosevelt, 137, 12° and. Rio de Janeiro. Equipment: 20 DC-3s; 6 C-46s; 1 Beech D-18; 3 Bonanzas. On Order: 4 C-46s; 21 C-82s.

Panair Do Brasil, S. A. Edificio Panair, Aeroporto Santos-Dumont, Caixa Postal 694, Rio de Janeiro. Equipment: 10 Constellations; 5 PBYs; 16 DC-3s. On Order: 4 DC-7Cs.

Real S. A. Transportes Aereos. Rua Conselheiro, Crispiniano, 379-2° andar, Sao Paulo. Equipment: 56 DC-3s; 6 Convair 340s; 3 DC-4s. On Order: 4 Convair 440s; 4 DC-6Bs.

S. A. Empresa De Viacao Aereo Rio Grandense (VARIG). Av. Borges de Medeiros 410-16° and. P. O. Box 243, Porto Alegre, RGS. Equipment: 23 DC-3s; 14 C-46s; 5 Convair 240s; 3 Super Constellations. On Order: 2 Super Constellations.

S. A. Viacao Aerea Gaucha (SAVAG). Edificio Camara do Comerico, Rio Grande Do Sul. Equipment: DC-3s.

Sadia S/A Transportes Aereos. Sao Bento 470-13, Sao Paulo. Equipment: DC-3s.

Servicos Aereos Cruzeiro Do Sul, S. A. (CRUZEIRO). Avenida Rio Branco, 128, P. O. Box 190, Rio de Janeiro. Equipment: 34 DC-3s; 6 AT-11s; 1 Convair 340. On Order: 3 Convair 340s; 10 F-1 Safaris.

Viacao Aerea Sao Paulo S/A (VASP). Rua Libero Badaro, 89, Sao Paulo. Equipment: 16 DC-3s; 9 Scandias; 1 Beechcraft.

BRITISH GUIANA

British Guiana Airways Ltd. P. O. Box 102, Georgetown. Equipment: Goose aircraft and DC-3s.

BRITISH HONDURAS

British Honduras Airways. 7 Cork St., P. O. Box 186, Ft. George, Belize. Equipment: 4 Cessnas.

CHILE

ALA—Sociedad De Transportes Aereos Ltda. Teatinos 304, Santiago. Equipment: 4 C-46s; 6 UT-8s; 1 C-87; 1 T-17.

Cia. Nacional De Turismo Aereo Cinta (Chilean Airlines). Hotel Carrera, Santiago. Equipment: 1 C-46; 2 DC-3s; 2 DC-4s; 2 Lockheed 10s; 2 Bonanzas.

Linea Aerea Nacional De Chile (LAN). Los Cerrillos, Santiago. Equipment: 3 DC-6Bs; 4 Martin 202s; 18 DC-3s; 2 Lockheed 10s; 1 Bonanza. On Order: 7 DC-6Bs.

Transa Chile Ltda. (Transportes Aereos De Chile). Agustinas 1161, Local 4, Oficinas 21-23, Santiago. Equipment: 3 C-46s. On Order: 2 C-46s.

COLOMBIA

Aerovias Nacionales De Colombia, S. A. (Avianca). Carrera 7, No. 16-14, Bogota.

Equipment: 3 Super Constellations; 12 DC-4s; 33 DC-3s.

Lineas Aereas Nacionales Consolidadas S. A. (LANSA). Calle 34, No. 45-23. Barranquilla. Equipment: 16 DC-3s.

Lloyd Aereo Colombiano. Bogota. Equipment: DC-3s; Cessna 310s.

Rutas Aereas Sam, Ltda. (RAS). Calle 51, No. 53-34, Apartado Aereo 1912, Medellin. Equipment: 3 DC-4s; 3 DC-3s.

Sociedad Aeronautica Medellin S. A. (SAM). Calle 51, No. 53-34. Apartado Aereo 1085, Medellin. Equipment: 6 C-46s; 3 DC-3s.

COSTA RICA

Lineas Aereas Costarricenses, S. A. (LACSA). Avenida la. No. 39 E., Box 1531, San Jose. Equipment: 3 DC-3s; 4 C-46s; 2 Convair 340s.

CUBA

Aerovias "Q," S. A. Cienfuegos 72, Havana. Equipment: 2 DC-3s; 4 C-46s.

Compania Cubana De Aviacion, S. A. (Cubana). Jose Marti Int'l Airport, Rancho Boyeros, Havana. Equipment: 2 Super Constellations; 1 Constellation; 1 C-46; 3 Viscounts; 7 DC-3s. On Order: 4 Viscount 800s.

Cuba Aeropostal, S. A. Apartado Postal 302, Havana. Equipment: 3 C-46s.

Expreso Aereo Inter Americano, S. A. (Expreso). Mercaderes 162, Havana. Equipment: 2 C-46s. On Order: 2 C-46s.

DOMINICAN REPUBLIC

Compania Dominicana De Aviacion, C. por. A. (CDA). General Andrew Airport, Ciudad Trujillo. Equipment: 5 C-46s; 2 DC-3s; 1 Beaver.

ECUADOR

Aerovias Ecuatorianas C. A. (AREA). Calle Benalcazar No. 675, P. O. Box 2226, Quito. Equipment: 2 Boeing 307s; 5 Ansons; 4 DC-3s; 3 Navions.

Ecuadorian National Airlines. Calle Venezuela 666, Casilla 3188, Quito. Equipment: 4 C-46s; 2 DC-4s. On Order: 2 C-46s.

EL SALVADOR

Taca International Airlines, S. A. San Salvador. Equipment: DC-4s.

GUATEMALA

Empresa Guatemalteca De Aviacion (AVIATECA). 12 Calles Poniente 6, Guatemala City. Equipment: 6 DC-3s; 1 DC-4. On Order: 1 DC-4; 6 DC-3s.

HAITI

Compagnie Haitienne de Transports Aeriens. Bower Field, Port-au-Prince, Haiti. Equipment: Beech D-18; DC-3; Boeing 307.

HONDURAS

Servicio Aereo De Honduras, S. A. (SAHSA). Avenida Colony, Cuarta Calle, Tegucigalpa, D. C. Equipment: 7 DC-3s.

Transportes Aereos Nacionales, S. A. (TAN). Edificio Marichal, Tegucigalpa, D. C. Equipment: 5 C-46s.

MEXICO

Aerolineas Mexicanas, S. A. Boulevard Aeropuerto, Central 161, Mexico City. Equipment: DC-3s.

Aeronaves De Mexico, S. A. (Aeronaves). Balderas 32, Mexico, D. F. Equipment: 4 Convair 340s; 3 DC-4s; 16 DC-3s.

Aero Transportes, S. A. (ATSA). Juarez No. 117-A, Mexico D. F. Equipment: 1 DC-4 (Leased from Cia. Mexicana de Aviacion).

Cia. Mexicana De Aviacion, S. A. (Mexicana). Balderas 36, P. O. Box 901, Mexico D. F. Equipment: 1 DC-7c; 4 DC-6s; 6 DC-4s; 19 DC-3s; 3 C-82s. On Order: 3 DC-7Cs.

Guest Aerovias Mexico, S. A. Paseo de la Reforma, 95, Mexico D. F. Equipment: 2 Constellations; 1 DC-4; 2 C-82s.

Trans Mar De Cortes, S. A. Avenida Serdan 227-229, P. O. Box 54, Guaymas, Sonora. Equipment: 3 DC-3s.

NETHERLANDS WEST INDIES

KLM Royal Dutch Airlines. Caribbean Div.: KLM Bldg., Dr. Albert, Plesman Airport, Curacao, N. A. Equipment: 4 Convair 340s; 4 DC-3s.

NICARAGUA

Lineas Aereas De Nicaragua, S. A. (LA NICA). Managua. Equipment: 6 DC-3s; 2 C-46s; 1 Beech D-18. On Order: 1 DC-4.

PANAMA

Aerovias Panama, S. A. (APA). Calle B., El Cangrejo, Panama, R. P. Equipment: 6 DC-3s.

Cia Panamena De Aviacion (COPA). 25 Avenida Peru, Panama, R. P. Equipment: 2 DC-3c; 2 C-46s.

PERU

Compania De Aviacion "Faucett," S. A. Hotel Bolivar 926, P. O. Box 1429, Lima. Equipment: 3 DC-4s; 3 DC-3s; 4 Faucett Monoplanes.

Grupo Del Transportes. 1414 Limatambo Airport, Lima. Equipment: 8 DC-3s; 6 Dragon Rapides; 3 Stinsons; 1 Beechcraft; 4 PBYs; 4 Beavers.

TRINIDAD

British West Indian Airways, Ltd. (BWIA). Airways House, 17 Chacon St., Port-of-Spain. Equipment: 4 Viscounts; 5 Vikings; 3 DC-3s.

URUGUAY

Compania Aeronautica Uruguaya, S. A. (CAUSA). Calle Colonia 1068, Montevideo. Equipment: 3 Sandringhams.

Primeras Lineas Uruguayas De Navegacion Aerea (PLUNA). Colonia 1013, Montevideo. Equipment: 6 DC-3s; 4 Herons. On Order: 3 Viscounts.

VENEZUELA

Aerovias Venezolanas, S. A. (AVENSA). Apartado de Corres, 943, Caracas. Equipment: 18 DC-3s; 3 C-46s; 5 Convair 340s.

Linea Aerea Taca De Venezuela C. A. (TACA). Carmelitas a Altagracia, P. O. Box 844, Caracas. Equipment: 13 DC-3s.

Linea Aeropostal Venezolana (LAV). Bloque No. 1, El Silencio, Caracas. Equipment: Super Constellations; Martin 202s; DC-3s.

Rutas Aereas Nacionales, S. A. (RANSA). 407 Edificio, America, Caracas. Equipment: 13 C-46s; 1 DC-3; 5 Cessna 180s; 1 Cessna 170; 2 Beavers; 1 twin Beech.

AFRICA & MIDDLE EAST

ADEN

Aden Airways Ltd. Khormaksar, Aden. Equipment: 8 DC-3s; 1 Dragon Rapide. On Order: 1 Dragon Rapide.

ALGERIA

CGTA-Air Algerie. 46 Bd. St.-Saens, Algiers. Equipment: 2 Constellations; 6 DC-4s; 3 DC-3s.

ANGOLA
(Portugese West Africa)

Divisao De Exploracao Dos Transportes Aereos (DTA). Rua Pereira Forjaz, P. O. Box 79, Luanda. Equipment: 6 DC-3s; 4 Beech D-18s; 3 Dragon Rapides.

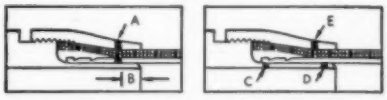
Aeroquip

Engineering Notes

B. A. MAIN, JR.

The advertisement at your right says the "***super gem***" Fitting is leakproof, and in this column we want to show why we believe this is true.

Three holes equally spaced around the fitting were drilled at A through the socket and through the hose inner tube. This was done to by-pass the lip seal and establish that the fluid would get by the compression area at some pressure level. Subsequent proof tests, using JP-4 fuel, showed that area under compression through length B would leak at approximately 1000 psi.



Next, holes were drilled at C, D and E in other samples to by-pass the compression area and establish the effectiveness of the lip seal.

The hose lines were then aged in air at 500°F for a total of 664 hours. They were checked as follows:

At 118 hours proof tested, using JP-4 fuel at 4000 psi—OK
At 160 hours proof tested, using JP-4 fuel at 4000 psi—OK
At 328 hours proof tested, using JP-4 fuel at 4000 psi—OK
At 664 hours proof tested, using JP-4 fuel at 4000 psi—OK

These tests were conducted on the —8 size. Further tests on other sizes resulted as follows:

—4 Size 504 hours total at 500°F ageing
No leakage at 5000 psi, using JP-4 fuel
No leakage at 29" Hg
Finally burst tests—Sample 1=13,000 psi
Sample 2=12,800 psi
No leakage at fittings before burst
—6 Size 480 hours total at 500°F ageing
No leakage at 5000 psi, using fuel
No leakage at 29" Hg
Burst tests not conducted
—8 Size Aged 106 hours at +500°F, then 24 hours at —88°F, then 360 hours at +500°F.
Checked at each stage:
No leakage at 5000 psi, using fuel
No leakage at 29" Hg
Burst tests—Sample 1=9500 psi
Sample 2=9000 psi
—10 Size 408 hours total at 500°F ageing
No leakage at 4200 psi, using fuel
—8 Size 816 hours total at 500°F ageing
No leakage at 4000 psi, using fuel
—6 Size 672 hours total at 500°F ageing
No leakage at 4000 psi, using fuel

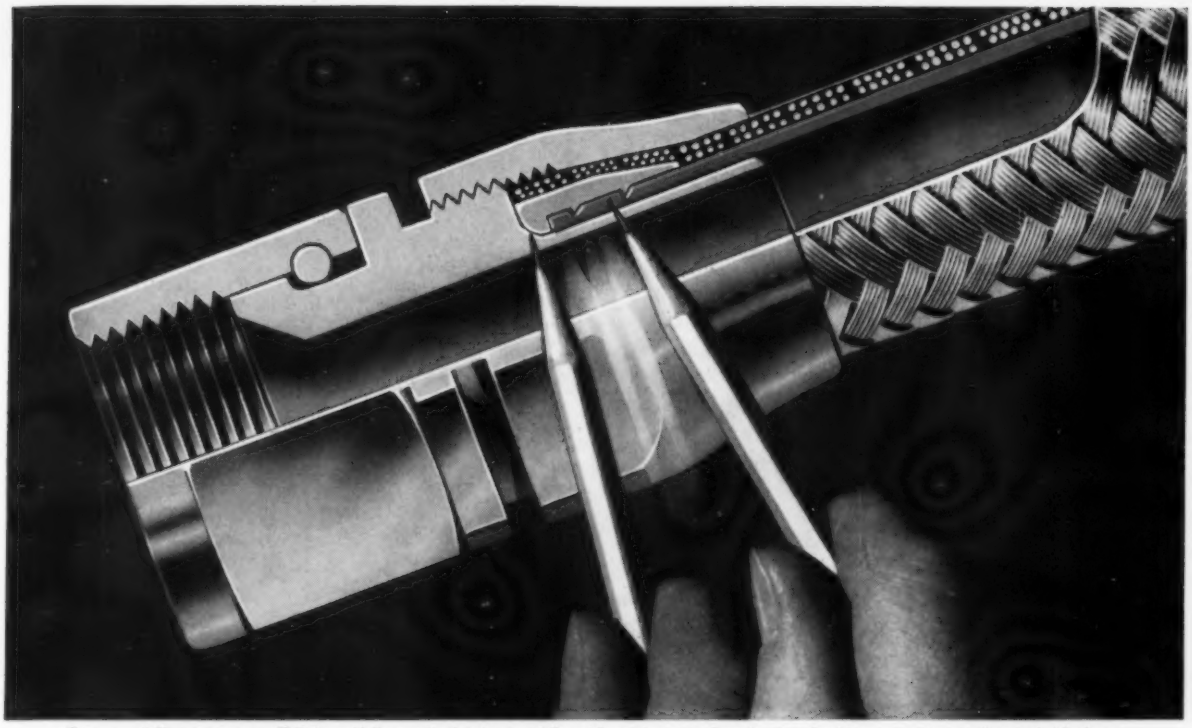
These tests demonstrate that the fitting design is sound. Beyond these tests the conventional tests such as the impulse test, fuel circulation tests and lubricating oil tests have been conducted on all the sizes —3 through —16 successfully, again substantiating the fitting.

Not completed yet is a continuous flexing and constant pressure test that has now been running somewhat over 4000 hours at about +400°F. This test covers four sizes from —4 through —12. We want to complete 6000 hours, after which higher pressure leakage tests and finally burst tests will be run. During the 4000 hours already accumulated there has been no leakage at the fittings.

In all of the tests, the "***super gem***" Fitting has not leaked. Compression fittings, both detachable and swaged, tested comparatively in these tests did leak.

B. A. Main Jr.

VICE PRESIDENT, ENGINEERING
AEROQUIP CORPORATION



Cutaway of "*super gem*" Fitting with line seal pointed out at left and lip seal at right. Together they furnish permanent protection against leakage.

The Only Leakproof Teflon* Hose Line!

BECAUSE OF AEROQUIP "*super gem*" FITTINGS

The method of fitting attachment provides the key to successful performance of Aeroquip Teflon Hose Lines in prolonged operation. Aeroquip's unique, patented "*super gem*" Fittings offer double protection against leakage:

1—a positive metal-to-metal line seal against all pressures.

2—a lip seal formed by the Teflon tube seated, but not compressed, in a special chamber within the fitting.

This means that the *hose assembly* life under pressure is as long as the life of the Teflon hose itself—a statement that cannot be made of assemblies using compression type fittings because of the cold flow characteristics of Teflon.

Because "*super gem*" Fittings are reusable and can be readily assembled with hand tools, Aeroquip Teflon Hose Lines offer many design and installation advantages. Fill in and mail the attached coupon for a copy of Aircraft Engineering Bulletin AEB-13.

Mock-ups and modifications are quick and easy because Aeroquip 666 Teflon Hose and Reusable "*super gem*" Fittings can be assembled and disassembled by hand.

"*super gem*" Fittings grip only the wire cover on 666 Teflon Hose. This avoids possibility of cold flow or compression set which can decrease the effective life of the hose line.

Aeroquip Corporation,
Jackson, Michigan

Gentlemen:

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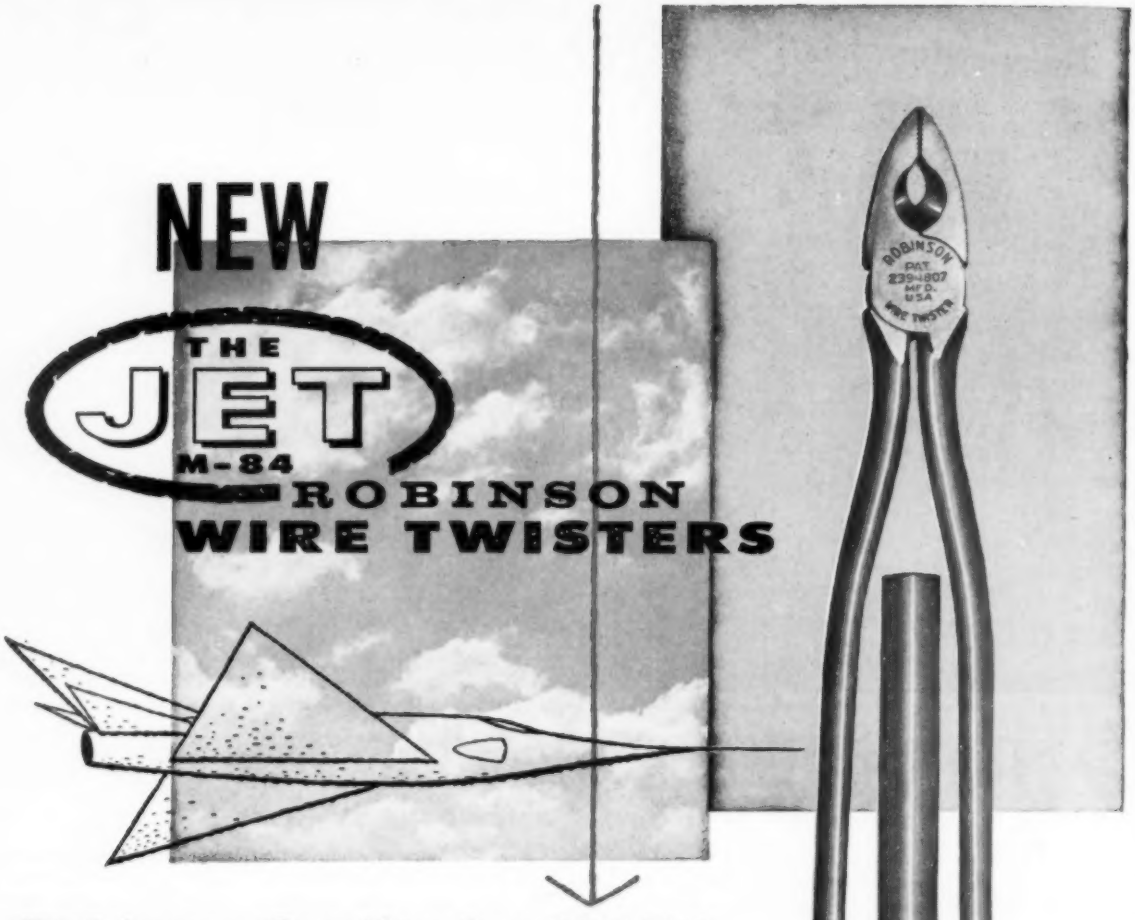

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Cyprus Airways, Ltd. P. O. Box 403, Nicosia. Equipment: 6 DC-3s.

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Misrair, S. A. E. Almaza Airport, Heliopolis, Cairo. Equipment: 7 Vikings; 1 Beechcraft; 3 Viscounts.

ETHIOPIA

Ethiopian Airlines, Inc. P. O. Box 1755, Addis Ababa. Equipment: 3 Convair 240s; 8 DC-3s. On Order: 2 DC-6Bs.

IRAN

Iranian Airways. Avenue Saadi, Teheran. Equipment: 2 DC-4s; 7 DC-3s; 4 Dragon Rapides; 2 Doves; 1 Twin Beech; 1 Fairchild; 2 Convair 240s.

IRAQ

Iraqi Airways (Iraq State Railway). Baghdad, West. Equipment: 3 Viscounts; 3 Vikings; 1 Dove. On Order: 1 Viscount.

ISRAEL

El Al Israel Airlines, Ltd. (El Al). 76 Maza St., P. O. Box 438, Tel Aviv. Equipment: 4 Constellations; 1 Britannia. On Order: 3 Britannia 310s.

Israel Inland Airlines Ltd. (ARKIA). 70 Ahad Ha'am St., Tel Aviv. Equipment: 2 DC-3s.

JORDAN

Air Jordan Co. P. O. Box 274, Amman, Jordan. Equipment: 3 DC-3s; 1 Dragon Rapide; 1 C-46.

Arab Airways (Jerusalem) Ltd. (AAJ). King Hussein Rd., P. O. Box 367, Amman. Equipment: 3 DC-3s.

KENYA COLONY

Caspar Air Charters & Agencies Ltd. (CASPAIR). P. O. Box 2238, Nairobi. Equipment: 3 Rapides; 2 Bonanzas; 1 Cessna; 1 Navion; 1 Pacer.

East African Airways Corp. (EAAC). Airways Terminal, Sadler St., Nairobi. Equipment: 9 DC-3s; 4 Dragon Rapides. On Order: 3 DC-4s.

KUWAIT

Kuwait Airways. Kuwait (Arabia). Equipment: 2 DC-3s; 2 Hermes.

LEBANON

Air Liban. Esseyli Bldg., Assour Square, P. O. Box 1243, Beirut. Equipment: 2 DC-4s; 3 DC-3s; 1 Lanquedoc.

Lebanese International Airways (LIA). Beirut Int'l Airport, Beirut. Equipment: 2 C46s.

Middle East Airlines Co., S. A. (MEA). Yared Bldg., Abduhl Aziz St., P. O. Box 206, Beirut. Equipment: 4 DC-3s; 3 Viscounts; 1 Bristol 170. On Order: 2 Viscounts.

LIBERIA

Liberian National Airways. Robertsfield Airport, Harbel. Equipment: 2 DC-3s.

MOROCCO

Air Atlas-Air Maroc (Compagnie Cherifienne Transports Aeriens). 65 Avenue de l'Armee, Royal. Equipment: 4 DC-4s; 4 DC-3s.

Air Outremer. 90 rue Amiral-Courbet, Casablanca. Equipment: Breguet 761s.

MOZAMBIQUE
(Portugese East Africa)

Divisao De Exploracao Dos Transportes Aereos (D.E.T.A.) Rua Araujo, 103-2°, L. Marques. Equipment: 4 Dragon Rapides; 6 Doves; 2 JU-52s; 3 Lodestars; 3 DC-3s.

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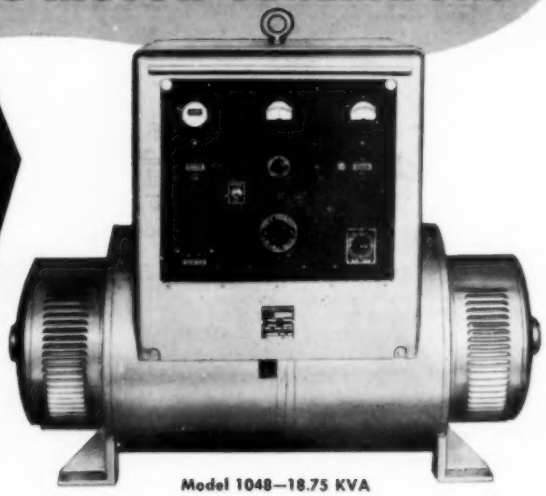

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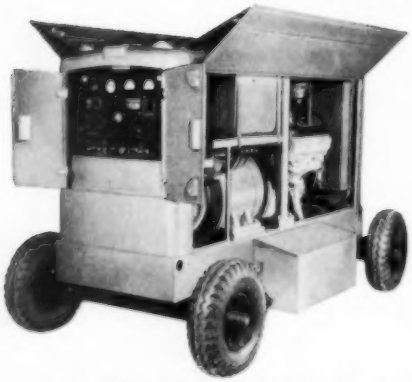

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NIGERIA

West African Airways Corp. (WAAC). P. O. Box 136, Airways House, Ikeja Airport, Lagos. Equipment: 5 Doves; 2 Bristols; 8 Herons.

SAUDI ARABIA

Saudi Arabian Airlines. Jidda. Equipment: 13 DC-3s; 5 Bristol 170s; 5 DC-4s; 10 Convair 340s.

SOUTH WEST AFRICA

Southwest Air Transport, Pty, Ltd. P. O. Box 731, Windhoek. Equipment: 6 Navions; 1 Dragon Rapide.

SOUTHERN RHODESIA

Central African Airways Corp. (CAAC). P. O. Box 1979, Salisbury. Equipment: 9 Vikings; 5 DC-3s; 5 Beavers; 5 Viscounts.

Hunting-Clan African Airways (Pvt) Ltd. P. B. 179 H, Salisbury, S. R. Equipment: 2 DC-3s; 3 Dragon Rapides. On Order: 1 DC-3.

SUDAN

Sudan Airways. Sirdar Ave., P. O. Box 253, Khartoum. Equipment: 4 Doves; 4 DC-3s. On Order: 1 DC-3.

SYRIA

Syrian Airways. P. O. Box 417, Damascus. Equipment: DC-3s; Beechcraft; de Havilland; Fairchild.

TUNISIA

Societe Tunisienne De L'Air (Tunis Air). 1 Rue d'Athenes, Tunis. Equipment: 2 DC-4s; 2 DC-3s.

TURKEY

Turk Hava Yollari A. O. (Turkish Airlines). Cankiri Caddesi No. 88, Ankara. Equipment: 24 DC-3s; 7 Herons. On Order: 9 DC-3s; 7 Herons.

UNION OF SOUTH AFRICA

Commercial Air Services (Pty) Ltd. (COMAIR). P. O. Box 2245, Johannesburg. Equipment: 2 Cessna 195s; 2 Cessna 180s; 2 Cessna 170s; 1 Cessna 140s; 3 Lodestars.

South African Airways—Suidafrikaanse Lugdiens. P. O. Jan Smuts Airport, Johnannesburg. Equipment: 4 DC-7Bs; 4 Constellations; 7 DC-4s; 6 DC-3s. On Order: 7 Viscounts.

AUSTRALASIA & FAR EAST

AFGHANISTAN

Aryana Airlines Co. Ltd. P. O. Box 76, Kabul. Equipment: 3 DC-3s.

AUSTRALIA

Ansett Airways Pty. Ltd. (Ansett). Commonwealth Airport, Essendon, Victoria. Equipment: 5 DC-3s; 2 Convair 340s. On Order: 2 Convair 440s.

Ansett Airways Pty. Ltd. (Reefair). Flying Boat Div., Civil Aviation Flying Boat Base, Rose Bay, Sydney N. S. W. Equipment: 2 Sandringhams.

Australian National Airways Pty. Ltd. (A.N.A.). 289 William St., Melbourne, C. I. Equipment: 4 DC-6Bs; 2 DC-6s; 8 DC-4s; 14 DC-3s; 3 Bristol 170s; 1 Sycamore helicopter.

Butler Air Transport Ltd. Kingsford Smith Aerodrome, Mascot, Sydney. Equipment: 6 DC-3s; 2 Herons; 2 Viscounts. On Order: 5 Friendships.

Connellan Airways Ltd. Townsite Airport, Alice Springs, N. T. Equipment: 3 Dragon Rapides; 2 Dragonflys; 1 Auster; 1 Beech D-17; 2 Tiger Moths.

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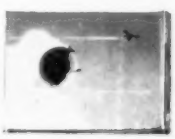

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worth, N.S.W. Equipment: 3 DC-3s; 2 Lockheed 18s. On Order: 1 DC-3.

Guinea Airways Ltd. (G.A.L.). Airways House, 132 N. Terrace, Adelaide. Equipment: 5 DC-3s; 2 Austers.

MacRobertson Miller Airlines Ltd. (M.M.A.). 194 St. George's Terrace, Perth, W. Australia. Equipment: 5 DC-3s; 3 Doves; 3 Ansons.

Qantas Empire Airways Ltd. (Qantas). Shell House, Carrington St., Sydney, N.S.W. Equipment: 14 Super Constellations; 5 DC-4s; 8 DC-3s; 2 PBYs; 1 Drover; 4 Beavers. On Order: 2 Super Constellations; 7 Boeing 707s.

Queensland Airlines Pty. Ltd. Eagle Farm Airport, Box 217D, G.P.O., Brisbane, Queensland. Equipment: 2 DC-3s. On Order: Heralds.

Trans-Australia Airlines (TAA). 339 Swanston St., Box 2806AA, G.P.O., Melbourne, C. 1, Victoria. Equipment: 9 Viscounts; 2 Convair Liners; 4 DC-4s; 22 DC-3s; 4 Drovers; 3 Dragons. On Order: 4 Viscounts.

Woods Airways Pty. Ltd. National House, 49 William St., Box K 783, G.P.O., Perth. Equipment: 2 Ansons.

BURMA

Union of Burma Airways Board (UBA). 104 Strand Rd., Rangoon. Equipment: 3 Doves; 10 DC-3s; 2 Marathons; 1 Auster; 1 Consul; 1 PBY. On Order: 3 Viscounts; 3 DC-3s.

CEYLON

Air Ceylon Ltd. P. O. Box 692, 3 Lotus Rd., Fort, Colombo 1. Equipment: 2 DC-3s.

FIJI ISLANDS

Fiji Airways. Box 112, Suva. Equipment: 1 Dragon Rapide; 3 Drovers.

FORMOSA

Asiatic Aeronautical Co. Ltd. 46 Chung Shan Rd., N., Second Section, Taipei, Taiwan. Equipment: 5 DC-3s; 22 C-46s; 2 PBYs; 3 DC-4s.

Civil Air Transport Co., Ltd. 46 Chung Shan Rd., N., Second Section, Taipei, Taiwan. Equipment: 2 DC-4s; 2 PBYs; 22 C-46s; 5 DC-3s.

HONG KONG

Cathay Pacific Ltd. Airway (Cathay). 1 Connaught Rd., Central, Hong Kong. Equipment: 1 DC-6; 1 DC-4; 1 DC-3. On Order: 1 DC-6B.

Hong Kong Airways Ltd. Alexandra House, Hong Kong. Equipment: DC-4. On Order: 2 Viscounts.

INDIA

Air-India International Corp. Registered Office: Mahatma Gandi Rd., Fort, Bombay 1. Equipment: 3 Constellations; 6 Super Constellations; 1 DC-3. On Order: 2 Super Constellations; 3 Boeing 707s.

Indian Airlines Corp. Thapar House, Jan Path, New Delhi. Equipment: 6 DC-4s; 66 DC-3s; 12 Vikings; 8 Herons. On Order: 10 Viscounts; 6 IL-14s.

INDONESIA

Garuda Indonesian Airways N. V. Djalan Nusantara 15, Djakarta. Equipment: 8 Convair 340s; 8 Convair 240s; 14 DC-3s; 14 Herons.

JAPAN

Far Eastern Airlines. Osaka Bldg., 1 Soze-Cho, Kita-Ku, Osaka. Equipment: Marathons and Doves.

Japan Airlines Co., Ltd. (JAL). Tokyo Bld. 8, 3-2, 2-chome, Marumouchi Chuo-Ku, Tokyo. Equipment: 5 DC-6Bs; 9 DC-4s; 2 Beechcrafts; 3 Herons. On Order: 4 DC-7Cs; 4 DC-8s.

KOREA

Korean National Airlines. Bldg. No. 1, 1-Ka, Chongno, Seoul. Equipment: 3 DC-3s; 1 DC-4.

LAOS

Air Laos. 4 Rue Pierre Morin, P. O. Box 87, Vientiane. Equipment: 6 DC-3s; 2 Boeing 307s; 2 Bristols; 2 Otters; 1 Beaver.

MALAYAN UNION

Malayan Airways Ltd. Ocean Building, Singapore. Equipment: 11 DC-3s; 3 Dragon Rapides.

NEW GUINEA

Gibbes-Sepik Airways Ltd. (GSA). Goroka. Territory of New Guinea. Equipment JU-52; 7 Norsemen. On Order: 2 JU-52s.

Mandated Airlines Ltd. (MANAIR). P. O. Box 25, Lae. Equipment: 3 DC-3s; 3 Dragons. On Order: 1 DC-3.

NEW ZEALAND

New Zealand National Airways Corp. P. O. Box 96, Wellington, C. 1. Equipment: 3 Douglas Freighters; 22 DC-3s; 6 Dragon Rapides; 4 Herons. On Order: 3 Viscount 800s.

Straits Air Freight Express Ltd. (SAFE). P. O. Box 751, Wellington, C. 1. Equipment: 4 Bristol 170s.

Tasman Empire Airways Ltd. (TEAL). Mechanics Bay, C.P.O. Box 2201, Auckland. Equipment: DC-6s and Solents.

PAKISTAN

Pakistan International Airlines Corp. M. A. Khuro Rd., Karachi 4. Equipment 3 Super Constellations; 4 Convair 240s; 10 DC-3s. On Order: 3 Viscount 815s.

PHILIPPINE ISLANDS

Philippine Air Lines (PAL). M. R. S. Building, Plaza Cervantes, Manila. Equipment: Convair 340s; Otters, Hiller Helicopters. On Order: 2 Viscounts.

TAHITI

RAI, Regie Aerienne Interinsulaire. c/o Messageries Maritimes, P. O. Box 96, Papeete. Equipment: 1 PBY. On Order: 1 PBY.

THAILAND

Thai Airways Co. Ltd. 6 Larn Luang Rd., Bangkok. Equipment: DC-4; DC-3; Norseman; Bonanza. On Order: Super Constellations.

VIET NAM

Air-Vietnam. 116 Blvd. Nguyen-Hue, P. O. Box 217, Saigon. Equipment: 4 Bristol 170s; 6 DC-3s.

Societe De Transports Aeriens En Extreme Orient (COSARA). 5-13 Rue Turc, Saigon. Equipment: 4 DC-3s; 4 S. O. Bretagnes.

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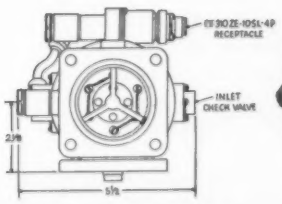

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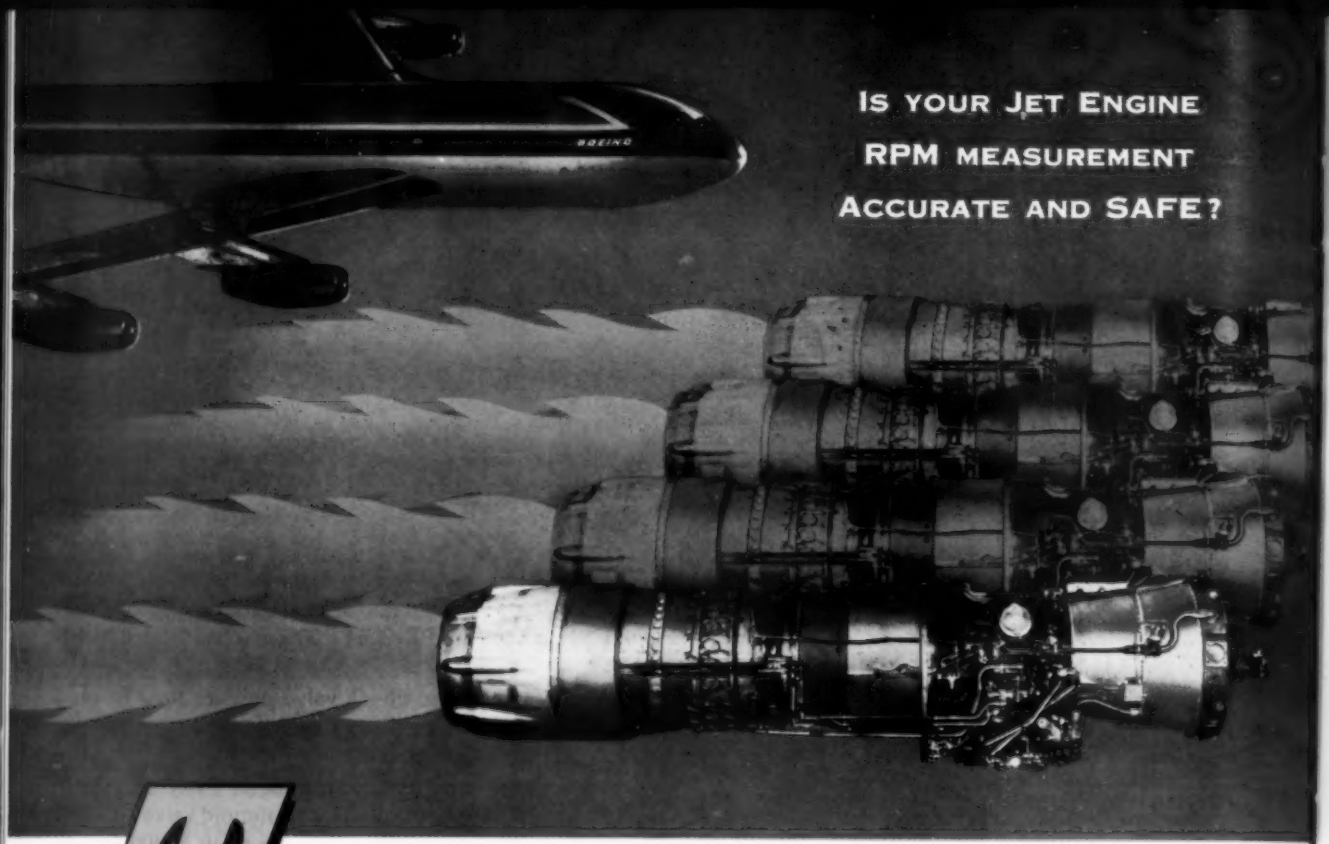

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The new B & H TAKCAL incorporates a refinement of the frequency meter principle. It operates in the low (0 to 1000 cps) range, reading the frequency of the tachometer generator on a scale calibrated in percent RPM corresponding to the engine's RPM. It reads engine speed while the engine is running with a guaranteed accuracy of ±0.1% in the range of 0 to 110% RPM. Additionally, the TAKCAL circuit can be used to trouble-shoot and isolate errors in the aircraft tachometer system, with the circuit and tachometer paralleled to obtain simultaneous reading.

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The TAKCAL operates accurately in all ambient temperatures from –40°F. to 140°F. Low in cost for an instrument of such extreme accuracy, it is adaptable to application in many other fields.

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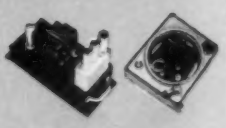

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Circle No. 48 on Reader Service Card.

WEST COAST TALK

by Fred S. Hunter

Donald Douglas doesn't pull any punches, even when it comes to Air Force

WE'D LIKE TO tip our hat—if we had a hat, that is—to Donald W. Douglas for the forthright manner in which he spoke up to protest the Air Force's termination of the C-132. It takes courage to criticize a customer like the Air Force, which can penalize you severely by the simple expedient of taking away your business, if it decides you've talked out of turn. But Douglas felt the cancellation of the C-132 was a backward step, and he said so.

We also find it comforting to learn the Douglas company's recently launched campaign to demonstrate the nation's need for an efficient airlift is attracting favorable attention in some of the right places. It's a pity Douglas didn't start it 10 years before. Then maybe Convair would not have had to truck the prototype of the Atlas missile from San Diego to Florida. Took 10 days. Which seems a new record in incongruity in view of the fact the Atlas itself is designed to do something like 5,000 miles in 20 minutes.

Jimmy Mattern's California Wing of the OX-5 Club got off to a real flying start at its "take-off" dinner at the Hollywood Roosevelt hotel. "Never saw so many old-timers in my life," said young old-timer Al Essig. The club, incidentally, has acquired an authentic emblem, a genuine OX-5 engine. Found it in a barn up in Redwood City.

Douglas has added 20 more inches to the length of the DC-8. They're tacked onto the nose. Keeps the superchargers out of a critical area just in case anything comes unglued. Air intake for the DC-8 superchargers is forward to get clean, uncontaminated air.

If IATA approves a third-class fare at the September meeting it will mean six-abreast seating and 170 passenger capacity for overwater versions of the Boeing 707 and Douglas DC-8. How long will it take to load a trip?

Convair will use a dynamic etching process it developed to produce internally grooved leading edges of the Convair 880 wing for anti-icing with hot bleed air. Leading edge material to be etched is the forward 10% of the wing from the fuselage to the wing tip. An inner skin will then be riveted to the grooved leading edge to provide passages for the hot bleed air. The dynamic etching technique will provide a leading edge with an extremely smooth exterior surface combined with great strength and lightness, Convair says.

Lockheed's reason for dropping the Rolls Royce Tyne as an alternate power plant for the Electra is that the cost of making the changeover, including engineering, would up the price of the airplane too much to make it economical. Unless, of course, someone would come up with a big enough order to spread these costs over a large number of airplanes.

Thinking in the trade is that United Air Lines can be expected to place an order with Lockheed for Electras before long. This doesn't necessarily rule out UAL as a prospect for a small jet eventually; it might decide it has to have both. We've heard speculation that UAL might favor a version of the Electra incorporating a 120-inch plug in the fuselage to put more seats in the cabin.

General Electric is establishing a commercial turbojet engine maintenance training program on the following three-year schedule:

1957—General study of the engine.
1958—Typical engine study and training.
1959—CJ805 engine study and training.

First two phases will be conducted at airline bases and the final phase at GE's Cincinnati facility.

Douglas has sold its test DC-7C to Panair do Brasil. At last reports, Douglas had some icing tests it wanted to make, after which the airplane is to be cleaned up for delivery to the carrier. Douglas, incidentally, has a 2,000-pound increase in the landing weight of the DC-7C coming up.

Lockheed makes a significant comment on Electra sales in its annual report to stockholders. "We have sold Electras more rapidly to this point than we did our Constellations." It adds that the company believes orders will continue through the 1960s.

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**Originally introduced as Bendix† Scinseal, this remarkable protective covering for wiring assemblies has achieved wide acceptance because of its versatility and adaptability to virtually any installation condition. Benseal is identical to the product produced under the former name Scinseal.*

If your operations require the use of wiring assemblies which must function in extreme temperature conditions or withstand other environmental hazards, you need the protection of Benseal. It is the perfect protective material for wiring assemblies and usually eliminates the need for metal conduits.

The Benseal process was developed by Scintilla Division of Bendix for the fabrication of wiring assemblies using polyvinyl sleeving and molded junctions. It is formulated to provide wiring with an air-tight seal against operational hazards and gives the protection you need, whether your problem is extreme heat, extreme cold, fuel and acid proximity or, perhaps, a combination of these factors.

Whatever your wiring assembly difficulties may be, it's a good bet that Benseal can help you solve them. It comes in varying colors, each indicating a different function, and can also be hot-stamped to provide positive identification. Many electrical connector adapter molds are available, as well as the T's, Y's and variable molds necessary to provide reliable assemblies of any configuration.

Detailed information and data on Benseal are available on request. SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, NEW YORK.

†TRADE MARK.

Scintilla Division
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PEOPLE

CANADAY

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MANUFACTURING

Name	New Position	Former Position
John E. Canaday	VP-pub. rel., Lockheed Aircraft Corp.	Corp. dir. of pub. rel.
Frank F. Davis	Domestic sales mgr., Lockheed's Calif. Div.	Commercial aircraft mkt. research
William G. Alexander	Chief engr., Stromberg-Carlson's San Diego plant	Westinghouse Elec. Corp.'s Air Arm Div.
J. B. Van Der Werff	Chief engr., Gladden Aircraft Products Corp.	Chief of research and devel., Parker Co.
Robert M. Hawley	Dir. sales and customer rel., Weapon Systems Div., Bell Aircraft Corp.	Military sales mgr., Avro Aircraft Ltd., Canada
Don Mac Iver	Pub. rel. mgr., Texas Instruments Inc.	Asst. dir. pub. rel., Missouri-Kansas-Texas RR
Norman C. Anderson	VP, Photoconductor-Transistor Div., Electronics Corp. of America	Div. mgr.
John D. Saint-Amour	President, Assembly Products, Inc.	VP-engrg.
Robert H. Pugsley	VP, sales mgr. and dir., Assembly Products, Inc.	Asst. sales mgr.
Milton Evans Chandler	Retires May 1	Engrg. mgr., and co-founder Chandler-Evans
Carroll V. Roseberry	VP and mgr. midwestern region, Westinghouse Electric Corp.	Mgr. commercial atomic power activities, Pittsburgh
Eugene M. Beattie	Mgr. exec. aircraft operations, General Electric Co.	In chg., fit. assignments
Michael Gerald O'Neil	VP and exec. asst. to the president, General Tire & Rubber Co.	Exec. asst. to the president
Charles Prawdzik	Chief engr., device develop. section, General Transistor Corp.	With Federal Tele-communications Lab.
George J. Costello	Mgr., Ordnance Products Dept., W. L. Maxson Corp.	Ordnance sales mgr., Federal Telephone and Radio Co.
William V. Crowley	Sales mgr., western division, ALWAC Corp.	Advisor to the treas., North American Aviation
Dr. John C. Clark	Staff asst. to mgr. of Convair-Astronautics	Assn. leader, test div., Los Alamos Scientific Laboratory
Harvey N. Martin	Operational mgr., Norman Larson Co.	With Aircraft and Brokerage Co
Daniel Darnell, Jr.	Chief, customer rel. for North American Aviation's Autonetics Div.	Engrg. test pilot
P. M. Prophett	Asst. chief engr.-flt. test, Convair-San Diego	Chief of engrg. flt. test
Peter J. Andresakis	Personnel dir., Specialties, Inc., Syosset plant	Asst. dir. personnel, Reeves Instrument Corp.
Haywood C. Smith	Tech. mgr., research and devel. dept., Amer. Machine & Foundry Co.	Mgr. Raleigh Laboratory
Alfred Schaff, Jr.	Mgr. test and field service, Solid Rocket Plant, Aerojet-General Corp.	Field service div.
Andrew H. Bergeson	VP-in chg. Washington office, Stromberg-Carlson	VP-engrg.
Thomas Allinson	VP-marketing, Daystrom, Inc.	Gen. mgr. and dir. of mktg., Berkeley Div., Beckman Instruments
John R. McLeod	Mgr. pub. rel., research and advanced devel. div., Avco Mfg. Corp.	In Office of Naval Research
J. W. Stack	Dir. sales and contracts, Milwaukee plants of AC Spark Plug Div., General Motors	Advertising mgr., Flint, Mich., plants
Homer H. Rhoads	In financing, consolidation and underwriting of aircraft, electronics, and engineering firms	President, Hydro-Aire
R. W. Powell	Asst. div. mgr., Avionics Div., Aerojet-General Corp.	Chief engr.
Sherman M. Fairchild	President, Fairchild Camera and Instrument Corp.	President, Fairchild Recording and Equipment Co., dir. IBM and Fairchild Engine
Lorne W. Frame	Mgr. pub. rel. Orenda Engines, Ltd.	Pub. rel. dept.
Robert P. Gira	VP, Topp Industries, Inc.	Gen. contracts mgr.
John K. Gossland	Exec. vp and gen. mgr., Electromation Co.	Engrg. exec., Hoffman Laboratories
William R. Martin	Chief engr. and product mgr., RF Systems and Components Div., Electronic Specialty Co.	With Lockheed Aircraft Co.
Dr. Royal Weller	VP-engrgr., Stromberg-Carlson, div. of General Dynamics Corp.	Chief scientist, Naval Air Missile Test Center
Kenneth P. Bowen	Gen. mgr., Summers Gyroscope Co.	VP-mfg. and material, Northrop Aircraft
Lee S. Johnson	VP, Sikorsky Aircraft	Gen. mgr.
Frank R. Carver	Head, radar devel. dept., Hughes Aircraft Co.	Associate head
E. E. Herman	Head, radar systems dept., Hughes Aircraft Co.	Associate head
Lt. Gen. Laurence C. Craigie	Asst. to defense products group exec., American Machine & Foundry Co.	Cmdr. Allied Air Force, Southern Europe
Herbert E. Oles	Asst. gen. mgr. and acting gen. mgr., Rochester Div., American Machine & Foundry Co.	Dir. engrg., Cheektowaga Div.

AIRLINES

Fred Soucy	Gen. operations mgr., Riddle Airlines	Asst. operations mgr.
James M. Mask	Dir. of purchasing, Slick Airways	Buying supv., electronics sec., Texas div., Collins Radio Co.
Harold B. Lindberg	Dir. food service, Northwest Airlines	Asst. dir.
Archie D. Yawn	Sales promotion mgr., Southern Airways	Regional sales mgr.
William F. Callejo	Mgr. or properties, Slick Airways	Architect and airport consultant

GOVERNMENT

Brig. Gen. Arno H. Luehman	Dir. Office of Information Services, USAF	Cmdr. 3500th USAF Recruiting Wing, Wright Field
Rolland A. Harr	Dir. of aeronautics, Nebraska	Supv. airports, Nebraska

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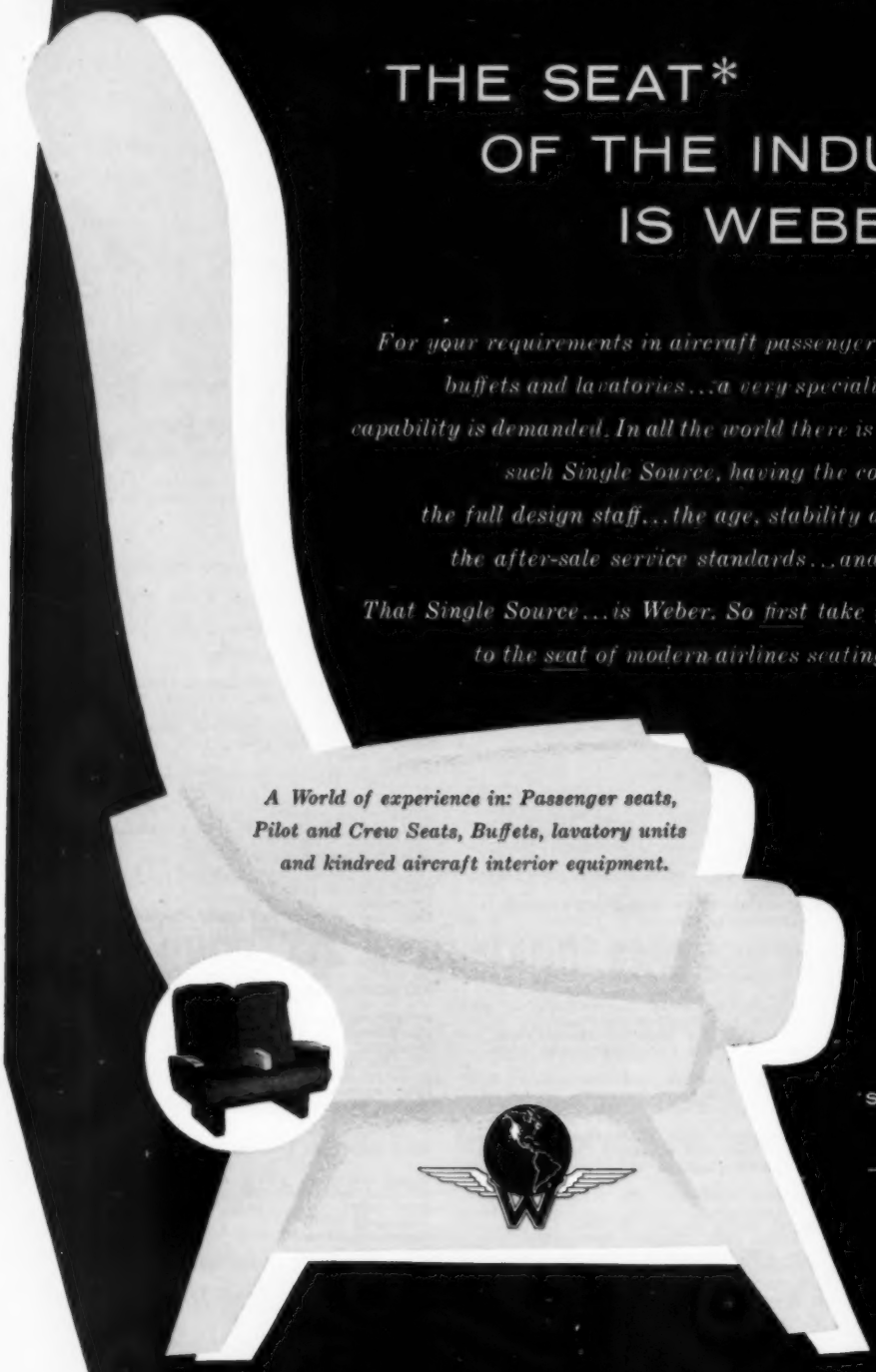

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*SEAT: "The place where anything...is settled or established" — Winston Dictionary

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Yugoslav airline operates like Free World carriers in some ways, like Soviet in others

Yugoslavia's state-owned and "worker-controlled" airline, JAT, like the Tito government itself, reflects a strange combination of Russian and free-world influences as it rounds out its first decade of service.

JAT is now busily engaged in expanding its links with both the free world and Iron Curtain nations. During its ten-year history under the Communist regime the Yugoslav carrier has depended on both Russia and the western democracies for technical assistance.

Today, JAT's fleet has a definitely American complexion, consisting entirely of DC-3s and Convair 340s. But Batrich Iovanovich, director-general of Yugoslavia's Civil Aviation Administration, says that JAT will soon acquire six Russian IL-14s (provided, of course, that Yugoslav-Soviet relations do not sour again before the craft are delivered).

Internationally, JAT flies to many important European and Middle Eastern cities: London, Paris, Zurich, Munich, Frankfurt, Rome, Milan, Vienna, Istanbul, Athens and Cairo. At the same time, Russia's Aeroflot, which makes six roundtrips weekly between Moscow and Belgrade via Kiev, Lvov and Budapest, monopolizes this important route and is the main foreign carrier serving Yugoslavia.

As a result of the post-Stalin thaw in Russian-Yugoslav relations, the two countries signed a bilateral air transport agreement in September, 1955. Prior to this pact, Aeroflot made only occasional cargo stops at Belgrade on its route to Albania.

Iovanovich says that the "friendly collaboration" between Yugoslav and Russian civil aviation organizations "will undoubtedly deepen."

Early this year, JAT began flying into neighboring Albania, a nation with which Tito had been feuding since his split with Stalin. Plans are also under way to inaugurate service to Sofia and Prague.

Altogether, Yugoslavia has concluded air transport agreements with 17 nations. Besides Aeroflot, Belgrade is served regularly by Polish, Czech, Rumanian, Bulgarian, Swiss and Italian carriers, with occasional trips by British and other lines.

Belgrade is the only Yugoslav airport equipped with concrete runways capable of handling planes weighing up to 30 tons. The other fields are limited to lighter craft.

A new Belgrade airport is currently under construction and is scheduled to be ready for traffic early in 1959. It will have a concrete runway 8,200 feet long, 200 feet wide and capable of handling planes weighing up to 135 tons.

Domestically, Yugoslavia's commercial air transportation has made significant gains during the postwar period. In 1955, JAT carried 102,365 passengers, compared to the 8,071 passengers handled by its military-controlled predecessor in 1946.

Belgrade is by far the largest traffic center in Yugoslavia. Over 55,700 passengers landed or departed at the capital city in 1955.

Airline passenger traffic at other major cities in 1955 included: Titograd, 35,073; Zagreb, 15,562; Dubrovnik, 15,349; Sarajevo, 13,797; Split, 6,175; and Skopolje, 5,125.

While Yugoslavia's Civil Aviation Administration has supervision over all air transportation and special-purpose and sports flying within the country, JAT legally possesses considerable independence.

JAT workers elect a council which, in turn, selects an executive committee that presumably has managerial powers. The workers' council ostensibly determines the carrier's basic policies.

However, the Civil Aviation Administration has direct control over all Yugoslav airports, flight safety and pilot certification. It also determines which domestic and international routes JAT will fly and handles JAT's relations with foreign governments.

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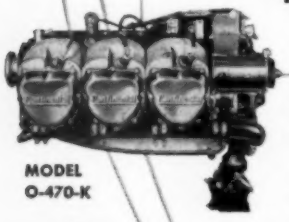
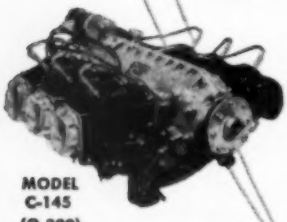


MODEL O-470-K



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TRANSPORT CHANGES

Andrew J. Kress, Jr. appointed city sales mgr. for United Air Lines at Baltimore, replacing G. W. Armstrong, moved to a staff position in New York.

G. D. "Dan" Boon named station ground services mgr. for United Air Lines at Philadelphia, replacing W. E. May, moved to a similar post at Newark, N.J.

Oliver Judd named station ground services mgr. for United Air Lines at Portland, Ore.

Yost Cunningham resigned as asst. dispatch mgr. with American Airlines' flight dept. in Chicago to operate his own resort hotel at Myrtle Beach, S.C.

John Minehan named acting mgr., West Coast North America, for Qantas Empire Airways; **Leslie J. Power** appointed New York dist. sales mgr.; **Donald N. Kiernan** named interline sales representative.

Guy de la Houssaye appointed station mgr. for Pan American World Airways at Fort de France, Martinique.

Jack Baum named manager of Emery Air Freight Corp.'s new office at Akron-Canton Airport, Ohio.

A. D. Yawn named sales promotion mgr. for Southern Airways, Inc.

Harry L. Backelin appointed Washington, D.C., district sales mgr. for Scandinavian Airlines System.

Stuart B. Goldthorpe appointed asst. vp-finance for Capital Airlines, in addition to being comptroller; **R. W. Hardesty** named asst. vp-operations; **Earl Raymond** appointed dir. of maintenance.

Robert O. Bruemmer appointed dir. of sales research and development, Trans World Airlines.

Ronald K. Carlson named director, Wage and Salary Div. of Northwest Orient Airlines' Personnel Dept. **Homer R. Kinney** transferred from Operations to Personnel Dept. as labor representative. **E. R. Brown** promoted to asst. district sales mgr. in New York.

Sterling Laville appointed Delta Air Lines' mgr. in Haiti and Dominican Republic, with offices in Port au Prince. **E. A. Thompson** promoted from supt. of cargo service to asst. mgr. of cargo, in Atlanta.

Bernard (Frank) Fernandes appointed San Francisco district sales mgr. for Airborne Freight Corp.

Glenn Nelson, former sales representative for Northwest Orient Airlines at Chicago, appointed gen. mgr. of Sino-British-Siam, Ltd's office at Bangkok.

Walter L. Ott promoted to maintenance training instructor for Mohawk Airlines.

Carl H. Horenburger named dir. of employee relations of Seaboard & Western Airlines.

L. G. Wood, United Air Lines' dist. sales mgr. in Boston, named New York City dist. sales mgr.; **Arthur Fairbanks** succeeds him in Boston. **Frank E. Conway** becomes staff supt. of cargo sales in UAL's new Midwestern Div. at Chicago; **Patricia Rudolph** appointed special events representative for the division. **M. L. Perry** named mgr. of reservations for UAL, and **G. M. Morris** appointed reservations operations supt.

Capt. Hamilton C. Smith appointed asst. supt. of flying operations for turbine training development for American Airlines.

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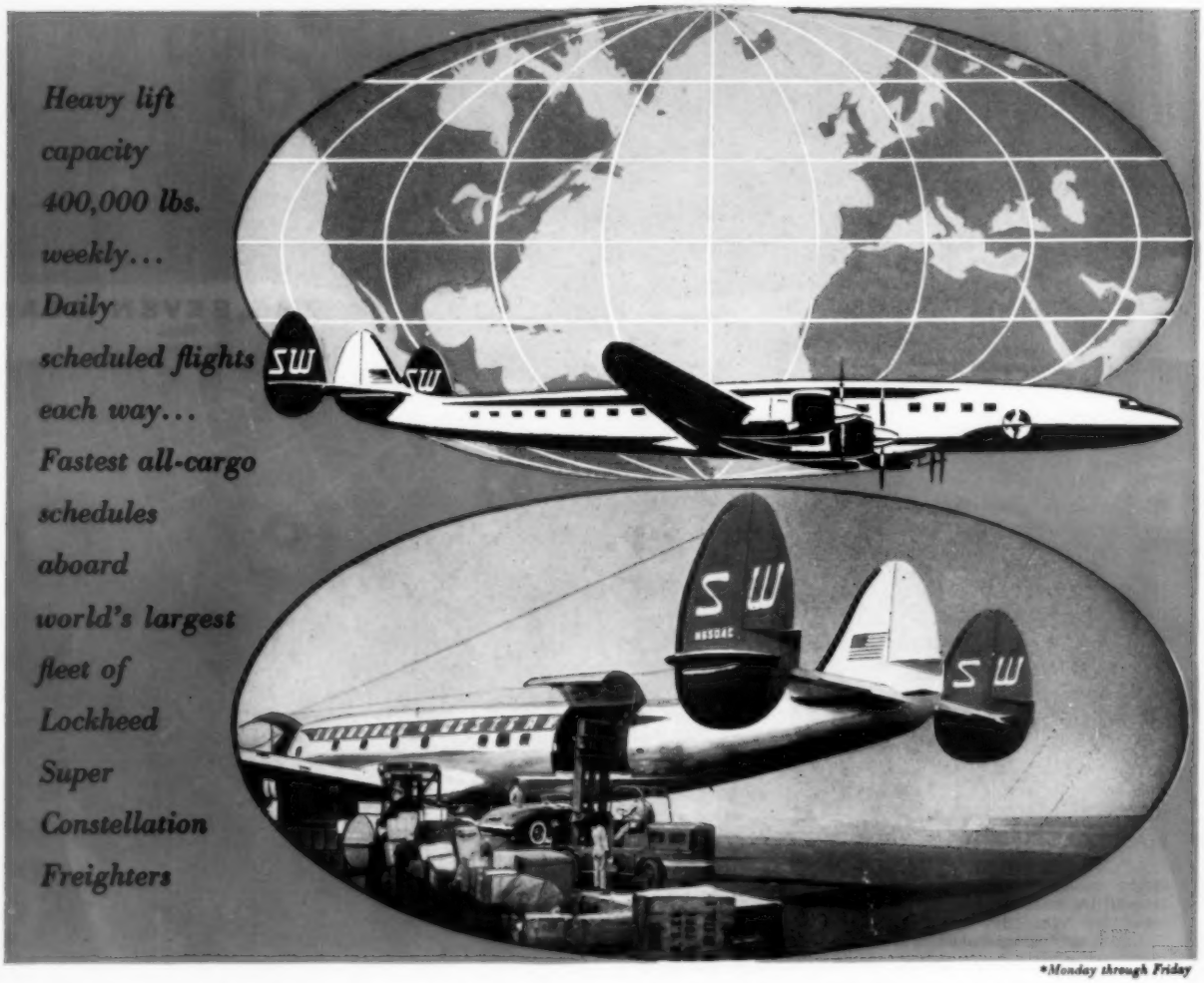
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U. S. CIVIL TRANSPORTS

Manufacturer and Type	WEIGHT	ENGINES	PERFORMANCE					CAPACITY						LOADING	SIZE	Remarks
	Gross, Empty (Operating)	Number Manufact. Type T.O. Power	Rate of Climb	Rate of Climb (one engine out)	Cruise Speed	Stall Speed	Range	Fuel	Payload	Volume Main Cabin	Volume Auxiliary Compartment	Volume Under Floor Cargo Holds	Seats	Wing, Power	Span Length Height	
	CBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft In	
BOEING																
B-377	145,800 83,500	4 P&W R4360 3,500	1,110	650	315	93	4,600	7,790	30,000	4,041	1,282	845	60-80	80.5 10.2	141' 3" 110' 4" 38' 4"	
707-120	247,000 110,600	4 P&W JT3C-4 10,000+	1,600	850	590	115	2,870	398	40,000	7,400	1,290	1,290 to 1,670	109-125	101.	130' 10" 138' 10" 38' 7"	Delivery 1958 In service 1959
707-220	247,000 110,300	4 P&W JT4A-3	3,340	1,900	610	115	2,900	17,398	39,000	7,400	1,290	1,290	109-147	102.	130' 10" 138' 10" 38' 7"	Delivery 1959 In service 1959
707-320	295,000 124,300	4 P&W JT4A3	2,750	1,490	600	115	4,110	23,580	38,000	7,400	1,500	1,500 to 1,700	122-147	101.	142' 5" 138' 10" 38' 8"	Delivery 1959
707-420	295,000 119,800	4 RR Conway	2,650	1,570	598	115	4,450	23,580	38,000	7,400	1,500	1,500 to 1,700	122-147	101.	142' 5" 138' 10" 38' 8"	Delivery 1960
CONVAIR																
240	41,200 27,208	2 P&W CB-18 2,400	....	....	272 90% NRP	92	910	1,000	9,262	1,651	344	88	40	50.4 8.6	91' 9" 74' 8" 26' 11"	179 built 1945-1947
340	47,000 29,486	2 P&W CB-16 2,400	....	....	284 90% NRP	86	2,015	1,750	12,660	1,816	436	77	44	51.08 9.8	105' 4" 79' 2" 28' 2"	209 built 1951-1954
440	49,100 31,305	2 P&W CB-17 2,500	1,230	....	289 90% NRP	87	2,180	1,730	12,880	1,816	436	77	44-52	53.3 9.82	105' 4" 79' 2" 28' 2"	70 built to date since 1955
880	178,500 84,658 to 85,010	4 GE CJ-805-1 10,000	....	....	615 90% NRP	3,000 (Variable)	3,000	10,770	22,360 to 26,320	4,300	350	850	88-112	89.3	120' 129' 6" 37'	Delivery in 1959
DOUGLAS																
DC-6	95,200 51,460	4 P&W CA-15 2,400	1,100	490	304	91	4,260	4,248	19,750	....	....	373	48-76	65.6 9.9	117' 6" 100' 7" 28' 8"	174 built 1946-1951
DC-6A	107,000 52,018	4 P&W CB-17 2,500	1,000	520	315	97	3,200 to 4,970	5,512	29,500	....	....	567	60-76	73.7 10.7	117' 6" 105' 7" 28' 8"	40 built since 1948
DC-6B DOMESTIC	100,000 54,193	4 P&W CB-16 2,400	1,040	530	315	95	3,200 to 4,360	4,934	23,490	....	....	509	50-102	68.4 10.7	117' 6" 105' 7" 28' 8"	228 built since 1950
DC-6B OVERSEAS	107,000 58,252	4 P&W CB-17 2,500	1,000	520	315	97	3,190 to 4,850	5,512	22,950	....	....	509	54-97	73.1 10.4	117' 6" 105' 7" 28' 8"	228 built since 1950
DC-7	122,200 67,292	4 WRIGHT R3350TC 3,250	1,320	570	358	99	4,050 to 4,430	5,512	20,000	....	....	631	64-99	83.5 12.5	117' 6" 108' 11" 28' 7"	83 built since 1951
DC-7B DOMESTIC	126,000 68,530	4 WRIGHT R3350TC 3,250	1,230	550	349	99	3,180 to 4,430	5,512	23,000	....	....	631	64-99	110. 12.5	117' 6" 108' 11" 28' 7"	26 built since 1953
DC-7B OVER-WATER	126,000 69,838	4 WRIGHT R3350TC 3,250	1,230	530	349	99	3,490 to 5,120	6,400	23,000	....	....	631	64-99	110 12.5	117' 6" 108' 11" 28' 7"	17 built since 1953
DC-7C	143,000 73,404	4 WRIGHT 988TC18ea1 988TC18ea4	2,260	1,450	359	99	5,320 to 6,010	7,824	22,591	....	....	651	58-99	89.5 10.5	127' 6" 113' 4" 31' 8"	55 built since 1954
DC-8 DOMESTIC	265,000 123,516	4 P&W JT3C or JT4A or RR CONWAY	2,850	1,740	561-586	....	3,530 3,890	17,600	33,620	....	....	1,445	122-144	96	139' 9" 150' 6" 42' 4"	
DC-8 OVERSEAS	287,500 128,742	4 P&W JT4A or RR CONWAY	2,550	1,540	562-586	....	3,900 to 4,830	21,615	35,930	....	....	1,445	132-144	104	139' 9" 150' 6" 42' 4"	

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THERE *is* a difference in Teflon tubing—and there is a patent to prove it. Resistoflex know-how in Teflon-processing assures you high integrity lines . . . genuine *aircraft quality.*

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U.S. CIVIL TRANSPORTS (cont.)

Manufacturer and Type	WEIGHT	ENGINES	PERFORMANCE					CAPACITY						LOADING	SIZE	Remarks
	Gross, Empty (Operating)	Number Manufact. Type T.O. Power	Rate of Climb	Rate of Climb (one engine out)	Cruise Speed	Stall Speed	Range	Fuel	Payload	Volume Main Cabin	Volume Auxiliary Compartment	Volume Under Floor Cargo Holds	Seats	Wing, Power	Span Length Height	
	LBS	HP/ESPH/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft In	
FAIRCHILD																
F-27	34,320 21,160	2 RR DART RDA6 1,600	1,480	1,200	282 65% NRP	....	2,250	980	10,200	....	....	355	32-40	45.8 9.9	95′ 76′ 27′ 6″	Production begins 1957
FRYE																
F-1B F-1B-1 F-1B-2	45,000 24,355	4 C-W 95767BA1 800	920	520	190 70% NRP	65	1,520 to 1,950	1,300	17,080 to 20,645	2,522.6	177	None	56-66 (passenger) variable in cargo-passenger model	30 14.06	109′ 6″ 79′ 5.7″ 30′	Prototype 1958 Production late 1958
LOCKHEED																
O49D	96,000 66,000	4 WRIGHT C18BA3 2,200	....	....	305	83	4,200	4,690	17,710	3,750	....	434	43-81	58.2 10.9	123′ 95′ 2″ 22′ 5″	73 built 1945-1947
649,649A	98,000 66,700	4 WRIGHT C18BD1 2,500	1,370	740	328	91	4,370	4,690	17,710	3,750	....	434	46-60	59.4 9.8	123′ 95′ 2″ 22′ 5″	19 built 1949-1951
749,749A	107,000 67,300	4 WRIGHT C18BD1 2,500	1,180	590	328	91	5,100	5,820	17,710	3,750	....	434	46-57	64.9 10.7	123′ 95′ 2″ 22′ 5″	114 built 1946-1951
1049	120,000 75,912	4 WRIGHT C18CA1 2,700	1,163	576	327	94	5,330	6,550	21,400	4,800	....	728	88	72.8 11.1	123′ 113′ 7″ 24′ 9″	24 built 1950-1952
1049C	133,000 70,062	4 WRIGHT R3350DA1 3,250	1,125	540	335	101	4,820	6,550	24,255	4,800	....	728	47-99	80.6 10.23	123′ 113′ 7″ 24′ 9″	48 built 1951-1954
1049D	133,000 70,950	4 WRIGHT R3350DA-1 3,250	1,125	540	335	101	4,940	5,820	36,200	4,875	....	693	CARGO	80.6 10.23	123′ 113′ 7″ 24′ 9″	4 built 1953-1954
1049E	133,000 70,167	4 WRIGHT R3350DA-1 3,250	1,125	....	334	101	4,940	6,550	....	....	....	....	47-94	....	123′ 113′ 7″ 24′ 9″	26 built 1953-1955
1049G	137,500 73,016	4 WRIGHT R3350DA-3 3,250	1,125	....	334	101	5,050	7,750	....	....	....	....	47-94	83	123′ 5″ 116′ 2″ 24′ 9″	88 built 1954
1049H	140,000 69,326	4 WRIGHT R3350DA-3 3,250	1,165	....	334	101	5,050	7,750	40,308	4,875	728	693	47-110	83	123′ 5″ 116′ 2″ 25′ 9″	10 built 1955
1649A	156,000 91,645	4 WRIGHT EA2 3,400	1,080	....	345	101	7,000	9,600	24,355	....	....	....	47-99	84	150′ 116′ 2″ 24′ 9″	5 built 1956
188 ELEC- TRA	113,000 56,000	4 ALLISON 501 3,750	2,950	....	400+	102	2,740- 3,680	5,280	21,638	....	119	....	44-91	86.9 7.54	99′ 104′ 6″ 32′ 1″	Production began 1956
MARTIN																
2-0-2	39,900 27,152	2 P&W R2800CA18 2,400	2,200	560	269	79	635	1,010	9,048	2,100	....	38	36	46 8.3	93′ 3″ 71′ 4″ 28′ 5″	
2-0-2A	43,000 28,869	2 P&W R2800CB16 2,400	1,885	382	270	79	1,135	1,350	7,631	2,100	....	83	36	49.8 8.96	93′ 3″ 71′ 4″ 28′ 5″	
4-0-4	44,900 32,339	2 P&W R2800CB16 2,400	1,905	385	256	81	600	1,360	11,592	2,250	....	107	40	51.9 9.3	93′ 3″ 74′ 7″ 28′ 5″	

U.S. MILITARY TRANSPORTS

Manufacturer and Type	WEIGHT 1. Max. Gross 2. Empty	ENGINES 1. Number 2. Mfgr. & Type 3. T.O. Power HP/Thrust	PERFORMANCE Rate of Climb (sea level)	Rate of Climb one engine out (zl/fpm)	Cruise Speed	Stall Speed	Range	CAPACITY Fuel	Payloads	Vol. Main Cabin	vol. auxiliary compartment	vol. other cargo compartment	Seats	LOADING 1. Wing 2. Power	SIZE 1. Span 2. Length 3. Height	Remarks
	LBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft In	
BOEING																
C-97	175,000 79,700	4 P&W R4360— 35 3,500	1,300	650	350	97	4,800	7,790	53,000	4,851	472	1,345	130 79lits.	84.5 10.7	141' 3" 110' 4" 38' 3"	
KC-97G	175,000 80,400 or 86,400	4 P&W R4360— 59 3,500	1,300	650	350	97	4,300	9,190	68,500	4,851	472	1,345	130 79lits.	84.5 10.7	141' 3" 110' 4" 38' 3"	Total 888 C-97 & KC97 aircraft built
KC-135	275,000	4 P&W J57 10,000	....	....	550+	....	....	....	....	....	....	....	....	....	130' 10" 136' 3" 38' 5"	35° sweptback wings. Being delivered to AF
CONVAIR																
T-29A/D	43,575 29,000	2 P&W R2800— 99W 2,500	1,370	....	247	92	2,000	1,550	....	1,651	344	88	9-16	53.8 9.1	91' 9" 74' 8" 27' 3"	Total built 364, production began 1949, ended 1954
C-131A	43,575 27,500	2 P&W R2800— 99W 2,500	1,410	....	247	92	1,600	1,550	....	1,651	344	88	39 27lits.	53.8 9.1	91' 9" 74' 8" 27' 3"	Total built 26, production began 1953, ended 1953
C-131B	47,000 29,846	2 P&W R2800— 103W 2,500	1,410	....	284	86	1,200	1,730	....	1,816.7	436.6	77.8	crew 4	51.08 9.9	105' 4" 79' 2" 28' 2"	Total built 36, production began 1953, ended 1955
YC-131C	47,000 25,556	2 Allison YT56A3 3,250	2,380	....	366	....	1,710	1,730	21,444	1,816	436	77	crew 4	51.08 9.8	105' 4" 79' 2" 28' 2"	Total built 2 in 1954
C-131D	47,000 29,600	2 P&W CB-16 2,400	1,220	....	284	86	1,260	1,730	12,660	1,816	436.6	88	44	51.1 9.8	105' 4" 79' 2" 28' 2"	Total built 33, production began 1954, ended 1957
R3Y-1	165,000 85,090	4 Allison T40-A10 5,850	....	....	350	90N	2,000	1,730	48,000	4,105	None	None	80 72lits.	84.0 7.5	145' 9" 139' 8" 51' 5"	Total built 5, production began 1951, ended 1956
R3Y-2	165,000 87,391	4 Allison T40-A10 5,850	2,500	....	350	90N	2,000	1,730	48,000	5,396	None	None	103 92lits.	84.0 7.5	145' 9" 139' 8" 51' 5"	Total built 6, production began 1951, ended 1956
R4Y-1	47,000 30,684	2 P&W R2800— 52W 2,500	1,330	1,220	284	86	2,400	1,730	16,316	2,300		None	44 21lits.	48.7 9.4	105' 4" 79' 2" 28' 2"	Total built 37, production began 1953, ended 1955
DOUGLAS																
C-47	26,000 18,100	2 P&W R1830 1,200	1,170	220	207	70	450	804	7,900	1,245	38.7			26.3 10.8	95' 63' 9" 16' 11"	Total built 10,125, production began 1942, ended 1945
C-54	62,000 38,900	4 P&W R2000 1,450	1,080	570	240	82	4,200	3,544	13,100	3,238	....	261		42.3 10.7	117' 6" 93' 5" 27' 7"	Total built 1,139, production began 1941, ended 1945
C-118A	107,000 52,018	4 P&W CB-17 2,500	1,000	520	315	97	3,200 4,970	5,512	29,500	....	....	567	60-76	73.7 10.7	117' 6" 105' 7" 28' 8"	Total built 166, production began 1951, ended 1956
C-124C	185,000 101,165	4 P&W R4360— 63A 3,800	1,260	540	264	106	1,000 5,120	11,058	56,511	10,000			200 127lits.	73.8 12.2	174' 1" 130' 5" 48' 3"	Total built 447, production began 1947, ended 1955
C-133A	275,000 114,213	4 P&W T34-P-7W 6,000	....	....	....	....	3,500 1,200	17,850	50,000 100,000	12,000			200	101 11.5	179' 7" 148' 5" 48' 3"	Production began 1954
FAIRCHILD																
C-123	56,500 31,380	2 P&W R2800— 99W 2,500	875	169	165 65% NRP	75	1,280	1,462	15,523	3,570	None	None	60 50lits.	46.19 11.3	110' 76' 3" 34' 1"	Total built to date 218, production began 1953
C-119	64,000 39,920	2 Wright R3350-89W 3,500	1,120	330	202	88	1,152	2,634	21,550	3,150			42	51.5 10.6	109' 3" 86' 3" 26' 3"	
GRUMMAN																
TF-1	21,000+	2 Wright R1820-82 1,525	....	....	150	....	1,000+		3,500				9 pass.	....	69' 8" 42' 3" 16' 3"	First flight January, 1955, operates from carriers

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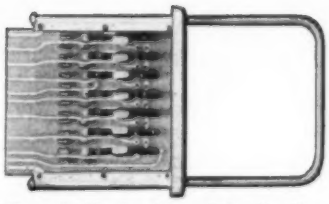

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U.S. MILITARY TRANSPORTS (cont.)

Manufacturer and Type	WEIGHT 1. Max. Gross 2. Empty	ENGINES 1. Number 2. Mfgr. & Type 3. T.O. Power HP/Thrust	PERFORMANCE Rate of Climb (sea level)	Rate of Climb one engine out (zl/fpm)	Cruise Speed	Stall Speed	Range	CAPACITY Fuel	Payload	Vol. Main Cabin	vol. auxiliary compartment	vol. other cargo compartment	Seats	LOADING 1. Wing 2. Power	SIZE 1. Span 2. Length 3 Height	Remarks
	LBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft & In	
LOCKHEED																
C-121C	135,000 81,238 or 77,672	4 Wright R3350 3,250	1,640	940	335	101	3,910	6,550	27,328 or 23,767	4,875		693	75 47lits.	82 10.4	123' 115' 24' 9"	
C-130A	124,000 58,707	4 Allison T56-A-1 3,750	2,500	....	330	....	2,880		40,000	3,690			92 74lits.	71.2 8.27	132' 2" 95' 2" 38' 4"	
R7V-2	150,000 72,219	4 P&W T34 5,550	3,110	1,920	440	....	3,139	8,770	36,360	4,875		463	87-106	92.8 6.75	117' 116' 2" 24' 9"	
STROUKOFF																
C-134	74,700 37,380	2 R3350-89A 3,500	1,230	100	218	68	863	2,100	28,800	4,200			73	56 10.67	110' 82' 7" 34' 8.5"	1 model built, has boundary layer control

FOREIGN TRANSPORTS

AVIATION TRADERS (ENGINEERING) LTD.																
MK.1 Accountant	28,500 16,650	2 RR DART 3,450	1,500	500	293 at 13,600 rpm	76	2,250	1,538	5,200	1,620	....	....	26	44.3 8.25	82' 6" 62' 1" 25' 3½"	
Mk.2 Accountant	28,500	2 RR DART 3,450	1,500	530	293 at 13,600 rpm	76	1,790	1,538	8,400	1,695	150	....	42	43.3 5.48	82' 6" 70' 6" 24' 7"	
BLACKBURN & GENERAL AIRCRAFT LTD.																
Beverley	135,000 82,000	4 Bristol Centaurus 2,950	800	350	195	88	3,380 max.	6,880	48,000	4,990	2,070	430	100	47.5 11.5	162' 99' 37' 5"	20 built since 1952
BRISTOL AIRCRAFT LTD.																
Britannia 100	155,000 81,388	4 Proteus 705 3,780	1,480	710	360	130 Flaps up	5,350	6,690	25,000	5,150	....	750	56-92	74.7 10.25	142' 3" 114' 36' 8"	13 plus 2 prototypes built since 1952
Britannia 300	160,000 82,827	4 Proteus 755 4,120	1,635	740	400	140 Flaps up	5,440	6,690	30,000	5,877	....	829	86-101	77.1 9.72	142' 3" 124' 4" 36' 8"	1 prototype built
Britannia 310	175,000 82,537	4 Proteus 755 4,120	1,430	580	400	143 Flaps up	6,545	8,490	28,000	5,877	....	829	66-139	84.3 10.62	142' 3" 124' 4" 36' 8"	1 prototype built
Britannia 320	175,000 82,557	4 Proteus 755 4,120	1,430	580	405+	143 Flaps up	6,555	8,490	28,000	5,877	....	829	66-134	84.3 10.62	142' 3" 124' 4" 36' 8"	
Britannia 250	175,000 83,715	4 Proteus 755 4,120	1,430	580	400	143 Flaps up	6,498	8,490	31,000	5,877	....	829	84-115	84.3 10.62	142' 3" 124' 4" 36' 8"	1st model due late 1957
HANDLEY PAGE LTD.																
Hermes 4	86,000 51,655	4 Bristol Hercules 763 2,100	1,030	475	270	99	2,000	3,206	17,000	3,492	....	262	40-68	61.2 10.2	113' 96' 10" 30'	25 built 1948-1952
Herald	37,500 23,200	4 Alvis Leonides Major 866	980	760	224	80.6	1,120	700	10,100	2,070	....	....	44	42.32 10.76	94' 9½" 70' 3" 22' 4"	2 prototypes built
HUNTING PERCIVAL AIRCRAFT LTD.																
President and Pembroke	13,500 8,739	2 Alvis Leonides 520/540	920	175	205	89	1,732	895	....	....	....	....	6-12	33.7 12.7	64' 46' 6" 16'	

FOREIGN TRANSPORTS (cont.)

Manufacturer and Type	WEIGHT	ENGINES	PERFORMANCE					CAPACITY						LOADING	SIZE	Remarks
	Gross, Empty	Number Manufact. Type T.O. Power	Rate of Climb	Rate of Climb (one engine out)	Cruise Speed	Stall Speed	Range	Fuel	Payload	Volume Main Cabin	Volume Auxiliary Compartment	Volume Under Floor Cargo Holds	Seats	Wing, Power	Span Length Height	
	LBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft & In	
DEHAVILLAND AIRCRAFT CO. LTD.																
Comet 4	152,500 71,770	4 RR Avon RA29 10,500	....	....	500	....	2,945	8,860	16,700 to 19,000	....	....	....			115' 111' 6" 28' 6"	
Comet 4A	151,500 71,770	4 RR Avon RA29 10,500	....	....	530	....	2,040	8,730	19,066	....	....	418			107' 9.7" 114' 10" 28' 5"	
Comet 2	120,000	4 RR Avon MK.117 7,320	....	....	480	....	2,300	6,920	13,000	....	....	....			115' 96' 28' 6"	
Heron 2	13,500 8,666	4 DH Gipsy Queen MK.2 250	1,075	620	183 65% NRP	75	400	184	3,014	....	....	....	14		71' 6" 48' 6" 15' 7"	
Dove	8,800 5,678	2 DH Gipsy Queen MK.2 380	920	220	179 60% NRP	....	300	112	1,703	....	....	....	8		57' 39' 3" 13' 4"	
SCOTTISH AVIATION, LTD.																
Twin Pioneer	13,500 9,500	2 Alvis Leonides 504/8 520/540	1,000	140	117 44% NRP	58	315	180	3,146	730	....	34	16	20.13 12.5	76' 6" 45' 3" 13' 3"	7 built since 1956
Pioneer	5,800 4,230	Alvis Leonides 503/7 520/540	800	....	117 62% NRP	43	375	120	1,000	....	....	....		14.85 10.38	49' 9" 34' 4.75" 11' 5"	46 built since 1953
VICKERS-ARMSTRONG AIRCRAFT LTD.																
Viscount 700D	63,000 36,950	4 RR DART 6 MK.510 1,740	1,200	650	325	100	1,620	2,345	10,900	1,780	600	215	40-48	65.5 9.05	93' 8.5" 81' 10" 26' 9"	
Viscount 800	63,000 39,900	4 RR DART 1,740	1,200	650	320	103	1,500	2,315	12,900	2,350	610	270	53-64	65.5 9.05	94' 85' 26' 9"	
Viscount 810	67,500 40,760	4 DART MK.25 1,990	1,600	870	365	106	1,380	2,275	12,500	2,350	610	270	52-56	70. 8.5	94' 85' 8" 26' 9"	190 built since 1951
Viscount 840	69,000 41,350	4 DART MK.541 2,350	1,640	910	400	106	1,330	2,275	12,450	2,350	610	250	52-56	71.5 7.35	94' 85' 8" 26' 9"	
Vanguard	141,000 74,000	4 TYNE STAGE 2 5,315	1,800	1,050	420	110	2,650	6,120	25,000	4,520	1,130	1,360	76-122	92 6.63	118' 122' 10.4" 34' 11"	
SIR W. G. ARMSTRONG-WHITWORTH AIRCRAFT, LTD.																
AW650	82,000 44,000	RR DART 2,100	1,250	....	296	91	2,000	3,300	28,000	3,680	....	....	80	56 9.75	115' 86' 9" 27'	
DEHAVILLAND OF CANADA																
DHC4 Caribou	24,000 14,500	2 P&W R-2000-D5 1,450	1,580	420	185 51% NRP	59	600- 1,200	365	7,320	1,062	....	....	27 22 Lit.		95' 27' 8"	
DHC2 Beaver	5,100 2,960	1 P&W WASPJR 450	1,120	....	143 66% NRP	42	650	95	2,140	134	....	....	5-7	20.4 11.3	48' 30' 5" 10' 8"	1,081 built since 1948
DHC3 Otter	8,000 4,138	1 P&W R1340 600	735	....	160 66% NRP	45	1,098	214	3,632	345	....	....	10-12	21.3 13.3	58' 41' 9" 13'	220 built since 1951

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FOREIGN TRANSPORTS (cont.)

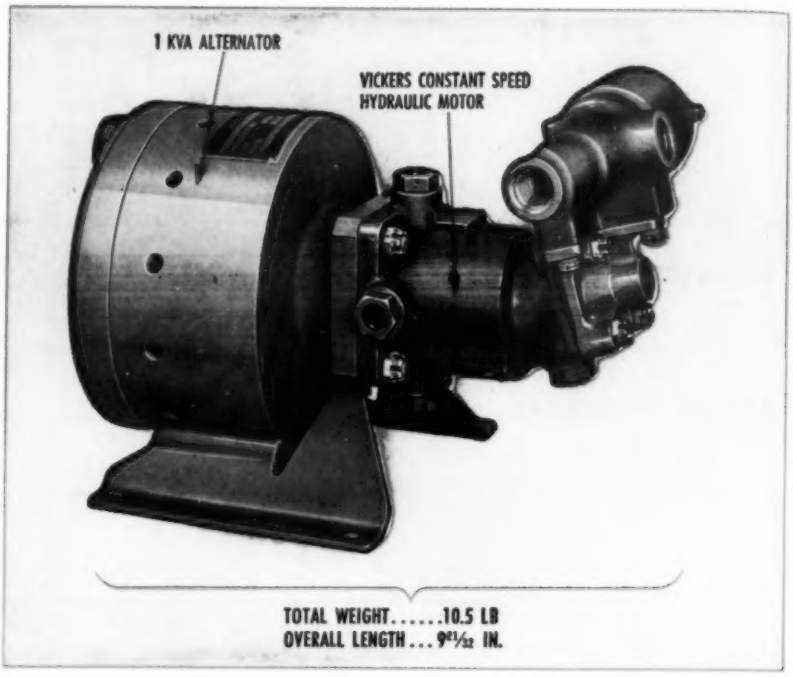
Manufacturer and Type	WEIGHT: Gross, Empty	ENGINES: Number Manufact. Type T.O. Power	PERFORMANCE: Rate of Climb	Rate of Climb (one engine out)	Cruise Speed	Stall Speed	Range	CAPACITY: Fuel	Payload	Volume Main Cabin	Volume Auxiliary Compartment	Volume Under Floor Cargo Holds	Seats	LOADING: Wing, Power	SIZE: Span Length Height	Remarks
	LBS	HP/ESHP/Lbs	Ft/ Min	Ft/ Min	MPH	MPH	Miles	Gal	Lbs	Cu Ft	Cu Ft	Cu Ft		Lbs/Sq Ft Lbs/BHP	Ft & In	
FOKKER																
F2F	34,520 22,000	2 RR DART MK.511 1,600	1,480	1,200	275- 280	. . .	300- 1,000	814	10,200	Vari- able	....	355	32-40	45.8 9.9	95′ 76′ 27′ 6″	
EDGAR PERCIVAL AIRCRAFT LTD.																
EP.9A	3,550 2,000	1 LYCOMING GO-480-B 270	1,070	....	126 67% NRP	43	575	56	1,000	130	70	....	6	15.65 13.16	43′ 6″ 29′ 9¾″ 13′ 4½″	25 built since 1956
EP.9B	4,140 2,000	1 LYCOMING GO-480-B 270	770	....	124 67% NRP	43	575	56	1,970	130	70	....	2+ Cargo	18.5 15.4	43′ 6″ 29′ 9¾″ 13′ 4½″	
F. G. MILES, LTD.																
HDM106	8,000 4,220	LYCOM ING GO-480 290	1,270	300	122 54% NRP	64	780	150	3,000	563	....	....	15	28.7 13.8	75′ 4″ 37′ 9″ 11′ 5″	Joint projects with Société des Avions Hurel Dubois under name H. D. et M (aviation) Ltd.
HDM106S	8,000 4,310	LYCOM- ING GSO-480B 340	1,560	410	132 53% NRP	64	....	150	3,000	563	....	....	15	28.7 11.8	75′ 4″ 37′ 9″ 11′ 5″	
HDM107	9,500 4,940	LYCOM- ING T53 808	4,170	1,490	173 54% NRP	67	....	300	3,000	563	....	....	15	31.7 5.9	80′ 38′ 6″ 16′	
LOUIS BREGUET																
Provence Deux Ponts	113,800	4 P&W R-2800 CA-18 2,400	900	450	250	90	2,740	4,000	24,000	5,900	....	....	107	57 11.9	140′ 95′ 31′ 8″	
CANADAIR LTD.																
North Star Argonaut	82,000	4 RR Merlin 724 1,760	....	....	232	...	3,290	....	12,000	....	....	....	40-57	55.1 11.7	117′ 6″ 93′ 5″ 27′ 7″	
DE HAVILLAND (AUSTRALIA)																
Drover	6,500	Gipsy Major 10,145	800	....	128	....	580	....	1,700	....	...	....	11	45.3 14.9	57′ 36′ 6″ 10′	
SUD AVIATION																
Caravelle	90,400 49,700	2 RR Avon RA29 10,500	....	....	481	....	1,820	....	15,400	6,000	600	280	70	63	112′ 6″ 104′ 10″ 28′ 6″	
Armagnac	165,348	4 P&W R-4360 3,550	....	....	264	..	4,040	.. ..	38,581	....	....	....	100	65	106′ 7″ 130′ 44′ 11″	
Languedoc	52,250	4 P&W R-1830 1,200	....	....	200	...	1,600	..	9,500	...	...	....	33-44	...	96′ 5″ 80′ 7″ 17′	
Bretagne	41,665	2 P&W R-2800 2,000	....	....	229	.....	1,960	.....	9,920	.....	....	....	42	45	[illegible]′ 2″ 62′ 2″ 16′ 1″	
Hurel- Dubois HD-32	39,600 23,000	2 P&W R-1830 1,200	836	177	169	73.6	1,450	955	13,170	2,048	....	....	44	36.8 16.5	148′ 6″ 72′ 2″ 27′ 10″	
HD-321	44,000 23,000	2 Wright 982C9HE1	975	226	172	77.7	1,480	955	17,300	2,048	....	....	44	40.9 14.4	148′ 6″ 72′ 2″ 27′ 10″	

New Vickers Airborne Electrical Power Package

. . . Saves Weight and Space

Utilizes the Hydraulic System for More Efficient Production of AC Power

This new isolated electrical power package provides closely regulated AC power with minimum weight and envelope while drawing its power from a hydraulic system. In new designs or when adding electronic equipment to aircraft designs in which the electrical system is already loaded to capacity, this versatile package provides the needed AC power from flow available in the hydraulic system. This generally is permissible without system change as the full flow is seldom demanded except for a few seconds under rare circumstances. Even in such cases, full flow can be guaranteed to these hydraulic functions through the use of a simple priority valve which starves the AC power package momentarily.



Less Weight and More Efficient

Important weight savings are achieved through the use of this package instead of an inverter which may also require an increase in the DC generator and line capacities. In one instance, the 10.5 lb 1 kva package replaced a 38 lb inverter for co-pilot instrumentation. An additional advantage is that the package has 62% overall efficiency while that of the inverter was 35-40%.

Extreme altitude operation is no problem as the Vickers isolated electrical power package contains no brushes or other altitude-sensitive components.

Features of AC Generator

The permanent magnet type AC generator has excellent life and reliability. It requires no bulky voltage regulator . . . is inherently smaller and lighter than conventional generators due to the elimination of the exciter and slip rings. It also has higher overall efficiency resulting from elimination of all excitation losses. Additional advantages are that the permanent magnet is unaffected by momentary short circuit, or separation of field and armature without keeper, or by temperature cycling. It is also not susceptible to aging or shock. This unit is 120/208 volt, three phase, wye connected with 400 cps at 8000 rpm. It is capable of continuous duty under environments of 0-55,000 feet altitude and ambient temperatures from −65 F to 250 F.

Hydraulic Motor Drive

The generator is directly driven by a Vickers Constant Speed Hydraulic Motor having fixed stroke and an integral flow control valve that maintains an 8000 rpm speed setting within ±2½% regardless of the load (as long as valve inlet pressure is greater than load requirement). For the unit shown above, maximum operating pressure is 3000 psi while rated output of 1 kva requires operating pressure of 2200 psi. Special configurations will maintain 400 cps frequency within ±0.1% regardless of load. This motor has a very high horsepower-weight ratio and its overall efficiency exceeds 92%. It is a time-proved design capable of many hundreds of hours of continuous service without attention.

Many Uses and Sizes

The applications for this isolated power source are numerous. For multi-engine aircraft, its use for co-pilot instruments provides dual reliability. This package has been used to supply controlled frequency AC power in emergencies when the only source of power in the airplane is a ram air turbine driven pump. The efficiency of this arrangement minimizes the size and weight of the ram air turbine necessary to provide emergency hydraulic and electric power. 7492

Now available in the sizes listed below, larger packages can also be supplied from existing components. Vickers is prepared to develop the package best suited to a specific need. For further information, write for bulletin A-5213 or get in touch with your nearest Vickers Aircraft Application Engineer.

Vickers Airborne Electrical Power Packages

kva output	weight, pounds
0.5	7.0
1.0	10.5
1.5	12.5
2.0	15
2.5	17
3.0	19

Larger capacities with minimum weight are available.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Aero Hydraulics Division

Engineering, Sales and Service Offices:

Administrative & Engineering Center
Detroit 32, Michigan

3201 Lomita Blvd.
P.O. Box 2003
Torrance, California

District Sales and Service Offices:
Albertson, Long Island, N. Y., 882 Willis Ave. • Arlington, Texas, P. O. Box 213 • Seattle 4, Washington, 623 8th Ave. South • Washington 8, D.C., 624-7 Wyatt Bldg. • Additional Service facilities: Miami Springs, Florida, 641 De Soto Drive

TELEGRAMS: Vickers WUX Detroit • TELETYPE: "ROY" 1149 • CABLE: Vidot

OVERSEAS REPRESENTATIVE:
The Sperry Gyroscope Co., Ltd.—Great West Road, Brentford, Middx., England

How to load 35 tons of cargo in 41 minutes

Six men loaded 69,790 pounds of cargo (approximately 35 tons) into the fuselage mockup of the turboprop C-133A in 41 minutes in a demonstration of the Douglas Aircraft Co.'s newly developed rapid loading conveyor and net tiedown systems at Long Beach, Calif.

The cargo comprised a simulated Military Air Transport Service load, including engine drums, a wing panel, tail pipes and palletized cargo.

Douglas developed the rapid-loading and tiedown systems for the Air Force to speed up ground-handling to match progress in the C-133A design. With aircraft currently in operation, the Air Force averages about 1.2 tons of cargo loading per man-hour. Douglas estimates its new system will enable the Air Force to load eight tons per man-hour in the C-133A.

The rapid-loading system consists of lightweight aluminum roller conveyors and 8x19 ft. fir plywood panels. Most conveyor sections are 10 ft. long and approximately 8 in. wide. These conveyors are held in position by quick-connect-disconnect hold-down fittings which attach to the seat studs located on the 20-inch grid pattern on the cargo floor.

Approximate ton weights of the rapid-loading conveyor and net tiedown systems are as follows:

10 ft. aluminum conveyor sections (52 weighing 22½ lbs. each)	1,170 lbs.
8 ft. aluminum conveyor sections (2 weighing 18¼ lbs. each)	36½ lbs.
5 ft. aluminum conveyor sections (5 weighing 16 1/3 lbs. each)	81 2/3 lbs.
Total conveyor system weight	1,288 1/6 lbs.
40x48 in. pallet (maximum capacity 63)	43 lbs.
8x10 ft. plywood panel (maximum capacity 10)	
¾ in. thickness	165 lbs.
½ in. thickness	110 lbs.
Cargo nets (6 weighing 114 lbs. each)	684 lbs.
Barrier nets (6 weighing 56 lbs. each)	336 lbs.
Total net system (including tiedown devices and controls)	1,500 lbs.
Complete loading and tiedown system weight (excluding pallets or panels)	2,788 lbs.

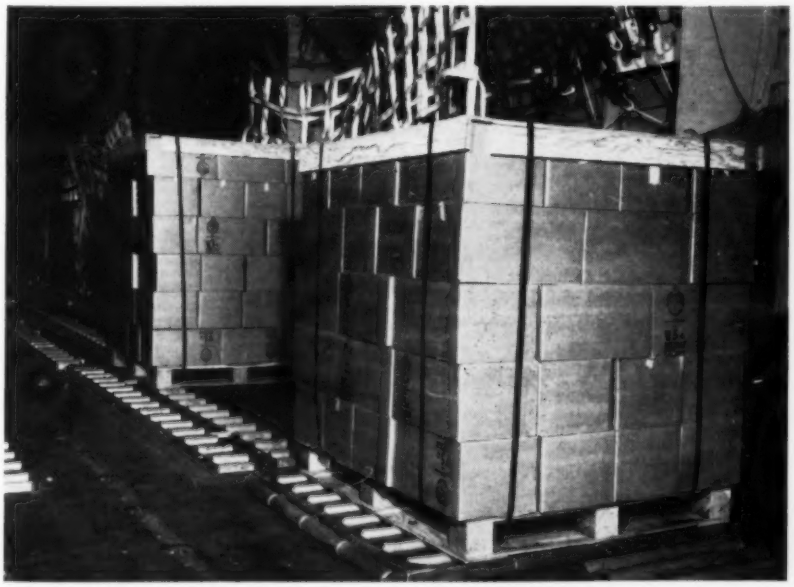
The conveyor sections may be installed to accommodate 8x10 ft. panels or 40x48 in. pallets. Latter, basically, are MATS pallets with two wood strips added to adapt to roller conveyors. Pallets may be moved laterally by a transfer dolly or by conveyor sections placed at an angle to the aircraft centerline.

Douglas reports four men can install the complete conveyor system in approximately six minutes and remove it in approximately four minutes.

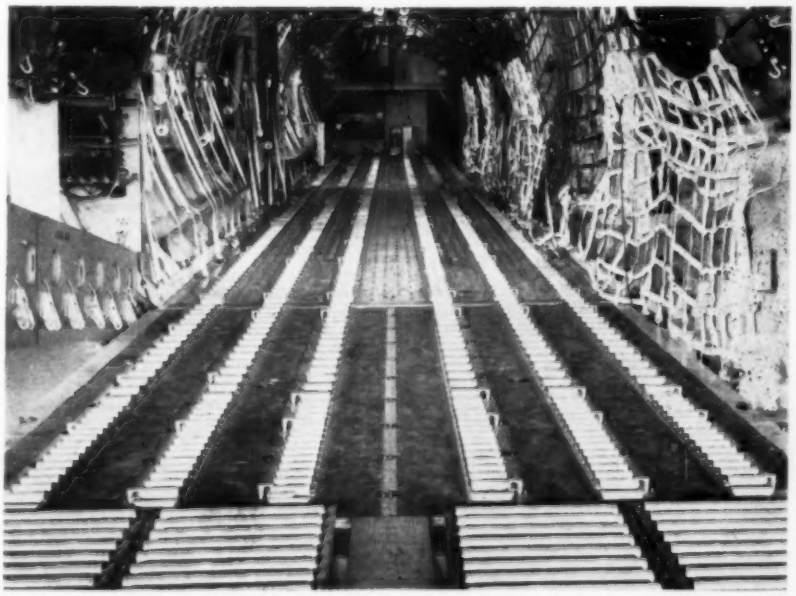
The net tiedown system is used to secure general cargo in the aircraft, minimizing individual tiedown device requirements. This system consists of six cargo nets for vertical and lateral restraint and six barrier nets for forward and aft restraint.

Prior to loading, the cargo nets are suspended along the right side of the aircraft cargo compartment and the barrier nets are suspended on the cargo nets.

During loading, the barrier nets are rotated into position and cargo is positioned against them. After all cargo is positioned, the cargo nets are lowered and secured.



LATERAL MOVEMENT of cargo in newly developed rapid-loading system for the Air Force's C-133A transport is possible with traversing dolly (foreground). Dolly is base equipment and carries 40x48 in. pallets laterally along the aft end of loading ramp.



ROLLERS MAKE POSSIBLE rapid loading of the C-133A. Complete roller conveyor and net tiedown systems weigh about 2,788 pounds, enable six men to load and secure some 70,000 pounds of cargo in 40 minutes.

United announces a superior new low-cost service...

DC-7 CUSTOM COACH

FASTEST LOW-COST NONSTOP BETWEEN NEW YORK AND SAN FRANCISCO

• **Delicious hot meal** (not a snack), served on convenient fold-down tables.

• **Reserved seats: new comfort arrangement.** Exclusive on United's DC-7 CUSTOM COACH, new seating arrangement provides more room for "6-footers," more aisle space, extra spaciousness and comfort for everyone. You choose your own reserved seat at check-in time, for your added convenience. Relax in the luxury of colorful, new interiors.

• **Nation's fastest airliner,** the DC-7, now makes six-mile-a-minute service available at economy fares.

• **For reservations** or for information, call United or an authorized travel agent.

FARE: ONLY $99 plus tax *(meals optional at nominal price).*

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DIGEST

NAA leads aviation contractors for 18-month period; General Dynamics second; five top billion-mark

Aviation companies continue to hold their commanding position among the 100 defense contractors receiving the largest volume of military prime contracts, according to the latest Pentagon tabulation.

During the 18-month period from Jan. 1, 1955, to June 30, 1956, 100 U.S. companies received $17,623,500,000 in prime contracts from the military services. This constituted 68.7% of all military contract awards during the period, or better than two-thirds of the $25,637,000,000 in prime contracts placed. (Only prime contracts in excess of $10,000 each are included in the figures.)

Almost half the national total—48.2%—was placed with 20 companies. Of these, 17 are manufacturers of aircraft, missiles, powerplants, aviation electronics and major components (see chart).

North American Aviation, Inc., led the parade of contractors on the 18-month breakdown with a total of $1,340,600,000 in prime awards during the Jan. 1, 1955-June 30, 1956 period. Second was General Dynamics Corp., whose Convair and Electric Boat Divisions aided in obtaining $1,339,700,000 in contracts during the period. Three other companies with more than $1 billion in awards during the period were United Aircraft Corp., General Electric Co. and Boeing Airplane Co.

How major U.S. aviation suppliers rank among 100 leading defense contractors

The following chart shows total prime military contracts received and ranking of major aviation suppliers in the list of the 100 largest defense contractors for the period Jan. 1, 1955 to June 30, 1956. It also shows the rank and total contract awards for the same suppliers, where available, for the six-year period from Jan. 1, 1950 to June 30, 1956 (in millions of dollars):

Company	Contracts (18 mos.)	Rank and contracts (6 yrs.)	
1. North American	1,340.6	6	4,180.8
2. General Dynamics (Convair)	1,339.7	7	4,074.9
3. United Aircraft Corp.	1,273.6	3	5,151.1
4. General Electric Co.	1,051.2	4	4,785.5
5. Boeing Airplane Co.	1,016.1	2	6,175.7
7. Ford Motor Co.	696.9	12	2,504.9
8. Lockheed Aircraft Corp.	657.5	8	3,552.7
9. Douglas Aircraft Co., Inc.	592.8	5	4,293.2
10. McDonnell Aircraft Co.	522.4	19	1,215.0
11. Hughes Aircraft Co.	477.1	23	790.8
12. Curtiss-Wright Corp.	464.2	10	2,404.6
13. The Martin Co.	406.0	17	1,325.8
15. Bendix Aviation Corp.	295.4	16	1,443.2
17. Chance Vought*	221.5	79	191.4
18. Radio Corp. of America	221.3	21	973.6
19. Sperry-Rand Corp.	209.2	14	1,493.6
20. Republic Aviation Corp.	200.8	11	2,332.1
22. Raytheon Mfg. Co.	179.9	35	554.1
24. General Tire (Aerojet)	160.5	46	406.9
26. Goodyear Tire & Rubber	134.4	29	673.9
27. Northrop Aircraft, Inc.	130.6	20	1,084.6
28. Philco Corp.	124.1	39	528.4
29. Avco Mfg. Corp.	119.6	31	641.8
31. Westinghouse Electric Corp.	101.9	18	1,250.1
33. General Precision Equipment	97.9	55	318.9
34. Continental Motors Corp.	93.0	49	377.0
35. Collins Radio Co.	88.7	44	430.2
36. Fairchild Engine & Airplane	88.6	28	676.7
38. Vertol Aircraft Corp.	85.2	48	379.0
41. Bell Aircraft Corp.	74.8	34	559.8
42. Firestone Tire & Rubber	72.8	40	501.9
45. Minneapolis-Honeywell	69.1	62	258.6
46. Sundstrand Machine Tool Co.	68.1	Not-Listed	
48. Hayes Aircraft Corp.	66.8	89	164.7
50. Gilfillan Bros., Inc.	65.4	70	218.5

* The discrepancy between Chance Vought's contract awards in the 18-month period and in the over-all six-year period apparently stems from large-scale Navy cancellations of orders in 1954 for an attack version of the Chance-Vought F7U-3 Cutlass.

The three companies appearing among the top 20 whose business is not predominantly "aviation" in character are American Telephone & Telegraph Co., in sixth place, General Motors Corp., in 14th place and International Business Machines Corp., in 16th place.

Based on a Pentagon list issued a year ago on contract awards to the 100 top companies during the six months ended June 30, 1955, several aviation companies experienced substantial changes in their relative rankings. Chance Vought jumped from 34th to 17th, McDonnell leaped from 20th to 10th and Ford Motor Co. climbed from 10th to 7th. But Curtiss-Wright Corp. fell from 5th place on the six-month list to 12th place on the 18-month tabulation.

AMERICAN AVIATION has worked out a breakdown of the contract awards to the top 17 aviation manufacturers during the year ended June 30, 1956. Unlike the 18-month breakdown, it shows the following lineup:

1. General Dynamics Corp., $965.3 million; 2. United Aircraft Corp., $952.3 million; 3. General Electric Co., $782.4 million; 4. North American, $694.4 million; 5. Boeing, $648 million; 6. Ford Motor Co., $505.9 million; 7. Lockheed, $464.4 million; 8. McDonnell, $463.1 million; 9. Douglas, $383.7 million; 10. Martin, $308.8 million; 11. Hughes, $306.1 million; 12. Chance Vought, $185.4 million; 13. Curtiss-Wright Corp., $181.2 million; 14. Bendix, $173.2 million; 15. RCA, $171.9 million; 16. Sperry-Rand Corp., $150.1 million, and Republic, $122.9 million.

Other aviation companies appearing in the listing of the top 100 but not listed on the accompanying chart are: American Bosch Arma Corp., 55; Lear, Inc., 59; Garrett Corp., 64; International Telephone & Telegraph, 66; Consolidated Diesel Electric Corp., 68; Westinghouse Air Brake Co. (Melpar), 72; Chrysler Corp., 80; Cessna Aircraft Co., 90; Hazeltine Corp., 92; Standard Coil Products Co., 94, and California Eastern Aviation, Inc., 95.

ARDC reorganizes directorate of development

Air Research and Development Command has reorganized the office of Brig. Gen. Marvin Demler, Deputy Commander for Research and Development.

Effective April 15, the Directorate of Development was abolished and divisions were consolidated into four new directorates—Air Weapons, Col. B. G. Holzman, director; Aeronautics, Col. P. F. Nay, director; Communications and Electronics, Col. G. T. Gould, Jr., director; and Human Factors, Col. P. H. Mitchell, director.

ARDC also created the post of Assistant Deputy Commander for Research and Development Program Control under Col. J. V. R. Dickinson.

(Digest continued on p. 184)

IN ASIAN WATERS—Aboard the U. S. Navy aircraft carrier *Boxer* off the coast of Japan, sonar-equipped Sikorsky HSS helicopters carry out anti-submarine exercises. The commercial version of this helicopter, the S-58, is active offshore in the Gulf of Mexico flying men and material to oil drilling rigs.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

ANTARCTIC OPERATIONS prove the ability of versatile Sikorsky helicopters to work under extremes of climate and under unusually difficult maintenance conditions. Here a Sikorsky HO4S, one of four with Task Force 43, lands beside the icebreaker *Glacier* to pick up cargo.

AT FORT RUCKER, Alabama, the Sikorsky H-37A is being service-tested by the U.S. Army Aviation Board. Data on maintenance and logistics will be gathered, in preparation for the time when the Army flies large fleets of these twin-engined helicopters, each able to carry 26 combat-ready troops.

BRUSSELS TO PARIS HELICOPTER SERVICE—With its new fleet of 12-passenger Sikorsky S-58s, SABENA Belgian World Airlines this spring inaugurates passenger service between Brussels and the center of Paris, close to the Eiffel Tower. The big, versatile S-58s are already flying on SABENA's other helicopter routes in Europe. In the New York metropolitan area, S-58 passenger service is also being operated by New York Airways.

HELICOPTER HISTORY

FIRST DELIVERY FLIGHT

In May, 1942, the pioneering Sikorsky XR-4 arrived at Wright Field, Ohio, after its historic 761-mile delivery flight from Bridgeport, Conn., piloted by C. L. "Les" Morris. The R-4 became the first helicopter to see service in World War II. It accumulated 50,000 hours before being superseded by later types.

SIKORSKY AIRCRAFT
BRIDGEPORT, CONNECTICUT
One of the Divisions of United Aircraft Corporation

(Continued from p. 181)

President wants independent Airways Modernization Board; Democratic leaders say it may multiply confusion

PRESIDENT EISENHOWER has asked Congress to approve a sweeping proposal that would set up an independent Airways Modernization Board empowered to select, test and evaluate air traffic control systems.

The plan quickly collided with a charge by a Democratic aviation leader that the three-man board may merely multiply confusion.

Eisenhower urged establishment of an interim board which would coordinate civil and military research activities on the nation's air traffic control problem. The blueprint, drawn up by Presidential aide Edward P. Curtis, is the preface of a more far-reaching report on aviation facilities due to be released May 1.

Sen. A. S. Mike Monroney (D-Okla.) promptly voiced doubts over the proposal. "The emergency is too great and requires immediate action," declared the chairman of the Aviation Subcommittee that will hold hearings on the plan. "I doubt the wisdom of a three-man board as proposed by the President."

The Oklahoma lawmaker said the agency should be run by one man—not three.

Sen. Warren Magnuson (D-Wash.), chairman of the Senate Interstate Commerce Committee, introduced the legislation (S 1856). He called for early hearings, but stressed that he felt CAB, with new powers Congress might grant it, could go far toward achieving airways safety.

As proposed, an impartial chairman earning $20,500 annually would head the board. His vote would form a majority in a split decision between Defense and Commerce representatives, the other members of the board. Staffing calls for 20 "supergrades" and five scientific employes, authorized to name needed advisory committees.

By unanimous vote the Board could take over functions of air navigation and air traffic control now lodged in the Departments of Commerce and Defense. Its power includes presidential transfer of funds, facilities and personnel. One key clause would allow the Board to operate on its own appropriation without fiscal-year limitation—a request that's bound to earn close Congressional scrutiny.

The Board, AMERICAN AVIATION was told, would wipe out the present Air Navigation Development Board, eliminate certain functions of the Air Coordinating Committee, and absorb other responsibilities of CAA's Technical Development Center and similar military facilities.

The projected legislation exempts military air combat projects. However, final determination on the military nature of such activities would reside with the Board.

The plan would pave the way for Board officials to negotiate outside contracts and to use other government agencies on a reimbursable basis. It would grant the right to construct and refurbish laboratories, test facilities and obtain needed land.

White House officials emphasized that the program will not disrupt CAA's operational and CAB's regulatory powers.

They warned against over-night miracles, cautioning that "real results" may take three to five years. Based on the possibility of approval this year, termination date has been set as June 30, 1960.

Supporters of the President's plan are prepared to ask for supplementary funds for fiscal 1958. If early Senate reaction is any guide, the Administration's aviation planners clearly face mild to heavy turbulence ahead.

Vertol's turbine-powered VTOL

TILT-WING VTOL AIRCRAFT designed by Vertol Aircraft Corp. is undergoing functional tests. Designated Vertol 76, the aircraft was developed under Army contract in cooperation with the Office of Naval Research. A Lycoming T53 gas-turbine engine provides power for the rotor-propellers and for two ducted fans (one in the vertical and the other in the horizontal stabilizer), which control yaw and pitch.

CAB midair collision findings are inconclusive

Civil Aeronautics Board concluded its 10-months-long investigation of the June 30 collision of a United Air Lines DC-7 and Trans World Airlines 1049A with no firm conclusion as to what caused the worst air disaster in U.S. airline history.

Board's final accident report, a 53-page document, gives only the probable cause that "the pilots did not see each other" in time to avoid the collision.

CAB added that it is not possible to determine why the pilots did not see each other. However, it listed six factors, any one or a combination of which could have contributed. Specifically, the Board cited:

Intervening clouds reducing time for visual separation.
Visual limitations due to cockpit visibility.
Preoccupation with normal cockpit duties.
Possible preoccupation with other duties such as providing passengers with scenic view of canyon.
Physiological limits to pilot vision reducing the time opportunity to see and avoid each other.
Insufficiency of en route ATC advisory information due to inadequacy of facilities and lack of traffic control personnel.

Aircraft, missile obligations dominate DOD commitments

Aircraft and missiles account for more than two-thirds of all money obligated by the Defense Department during the four fiscal years ending June 30, 1958, according to Aircraft Industries Assn. They also represent 57.8% of defense procurement and production funds for the eight years beginning with the start of the Korean War in June 1950.

Over the eight-year period, an AIA report states, aircraft orders stand at 49.6% and missile obligations at 8.2%. Total obligated during the period was $124,348,916,000.

French jet to open tour of U.S. May 2

France's Sud-Aviation Caravelle will make its North American debut May 2 on a Miami-New York flight, launching a two-month demonstration tour covering 16 cities in the U.S. and Canada.

The Caravelle will be the first turbojet aircraft to be granted permission to land at New York's Idlewild Airport. Three turboprops, including scheduled Capital Viscounts, have landed there by permission of the Port of New York Authority.

(Continued on p. 186)

Speed

The "Caravelle" puts the power of two jet engines at the disposal of medium-haul passengers. Speed is no longer reserved for the long-range intercontinental transport.

The simplicity of the design reduces technical requirements and ground service to a minimum. Its high rate of climb enables the "Caravelle" to reach its cruising altitude within a few minutes; it descends from an altitude of 20,000 feet in three minutes, maintaining a speed of *500 m.p.h.* until just prior to landing.

Silence

Like all jet-propelled aircraft, the "Caravelle" is free of vibration. Furthermore, owing to the aft location of the jet pods, passengers enjoy complete silence.

Even quieter than the most luxurious car, the "Caravelle's" cabin has a sound level of only *82 decibels.*

Comfort

The "Caravelle" excels not only in speed and silence but also in comfort. The whole cabin is quiet and restful. From the first to the last row of seats, there is no "bad" seat.

Economy

The "Caravelle" pays its way better than any other airliner, even those operating on short stages such as Paris-London.

The MEDIUM-RANGE aircraft is designed expressly for medium-haul work. Operators appreciate its advantages which offer great passenger appeal.

It is not an "all-purpose" carrier, and there is no question of "speed at any price."

Instead there is a compromise formula: speed which *pays off.*

The "Caravelle" will go into service with AIR FRANCE on the Company's European and Mediterranean routes at the end of 1958.

SUD-AVIATION

Paris: Head Office: 3FB° de Montmorency
New York: 500 Fifth Avenue

(Continued from p. 184)

The French jet will make several demonstrations from New York International Airport early in May. The Caravelle is then slated to visit Washington, D. C. (if permission is granted); Atlanta, Miami, Dallas-Fort Worth; Houston; Kansas City; St. Louis; Chicago; Denver; Salt Lake City; Los Angeles; San Francisco; Seattle, Chicago and Montreal.

Domestic airlines adopt new 3-point plan aimed at cutting number of 'no-shows'

A three-point plan designed to reduce the number of passengers who make reservations and fail to show up for their flights has been adopted by the domestic airlines.

The agreement was reached by the Air Traffic Conference in New Orleans on April 12 after three days of meetings. The program includes:

1. A $3 penalty on no-shows on all except helicopter operators, who will assess a $1 charge. The penalty is effective Sept. 15, 1957, if CAB approves.

2. Reconfirmation of space for continuing and return flights, effective July 15. The reconfirmation rule had previously been dropped June 15, 1955, by majority vote of ATC.

3. A modified Minimum Time Limit plan for ticket pick-up, the modification to be effective June 1.

The entire plan will expire 90 days after ATC's 1958 spring meeting, and in no case later than Aug. 1, 1958.

ATC previously has been unable to agree on a no-show penalty. This time, however, three airline presidents and Stuart Tipton, president of the Air Transport Association, met in New York before the opening of the ATC meeting and paved the way for action.

C. R. Smith, American; E. V. Rickenbacker, Eastern, and Carter L. Burgess, TWA, said they were agreeable to a plan that would include a penalty, reconfirmation and MTL.

W. A. Patterson, United, who was unable to attend, sent word that he would agree if the plan had an early expiration date so it could be amended or dropped if found to be unsatisfactory. He also said that revenues from a penalty plan (increased revenue realized through reduction of no-shows) should exceed by 20% the cost of installing the plan.

A passenger will not be charged the $3 penalty if he cancels his space any time before departure. The ticket will not have to be presented for refund before departure. And if there is any question whether the penalty should be assessed, the airline will collect the penalty and give the passenger an application to fill out explaining why the $3 should be returned to him.

When a travel agent handles a reservation and the passenger no-shows, the agent will be entitled to $1 of the $3. He will retain one-third of the helicopter penalty.

Under the present MTL plan, there is no deadline on picking up a ticket on a reservation made after noon the day before departure. On June 1, this will be amended to state that the ticket must be picked up by 30 minutes before departure.

The former reconfirmation rule, dropped in 1955, had required a passenger to reconfirm if he stopped over more than 12 hours. The new rule provides that he must reconfirm if his planned arrival is on a date earlier than his scheduled flight-departure date and if there is at least 12 hours between planned arrival and scheduled departure.

AA plans jet service sooner than announced

American Airlines will begin transcontinental jet service three months earlier than first announced, according to President C. R. Smith. First New York-Los Angeles jet flights were originally slated for June 1959 and now have been scheduled for March 1959.

American has ordered 30 Boeing 707 jets for delivery beginning in 1958. In, addition, AA has placed orders for 35 Lockheed Electra turboprops and expects delivery of 25 before the end of 1959.

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6 years of progress reflect Ozark Air Lines growing importance

Adding more flights . . . serving more cities . . . modifying its fleet for still greater safety, comfort and economy . . . all are a part of the progress at Ozark during the past six years. Much of this progress was in the year just past. The number of passengers carried increased 30% in 1956. More than 5,000,000 miles were flown, exceeding 1955 mileage by 27%. Last year, too, Ozark began handling freight . . . carried well over a million pounds. New routes include service to Cedar Rapids, Rochester, and Minneapolis-St. Paul. Working closely with connecting air lines, Ozark's constant endeavor is to bring better service to its cities and passengers.

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Type 11-4133-01 is a size 11 torque transmitter synchro with 115V 400 cycle input. Accuracy is ±15′, null voltage 175 mv, stator output 90 volts and phase shift 6.5°. Impedances are $Z_{RO}=315+J1590$, $Z_{SO}=290+J773$ and $Z_{RSS}=520+J286$.

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Pan American proposes $8-million terminal facility to handle jet transport traffic at Idlewild

Pan American World Airways—first U.S. carrier to place a jet transport order—has come up with the first solid proposal on how to gear airport terminals for their arrival.

Under an $8-million project slated for installation at New York's Idlewild Airport, Pan American has developed an "undercover" terminal design engineered to handle a fully-loaded 160-passenger jet every 15 minutes.

The new three-story terminal, encompassing an area of about 100,000 sq. ft., will be covered by a cantilever roof of 176,000 sq. ft. area.

Roof will be of concave design to provide maximum clearance for aircraft empennage at its outer edge.

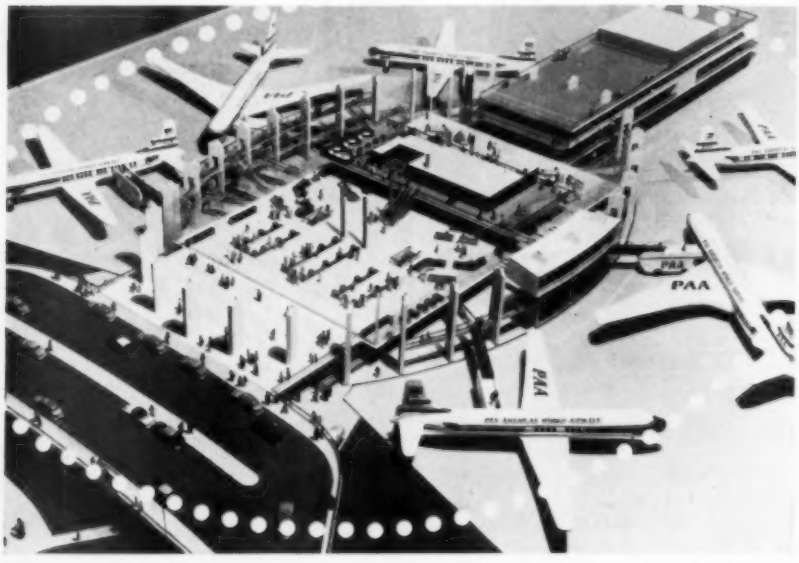
PAA officials estimate the new terminal layout will cost about $2 million more than a conventional terminal today, but that some savings will be realized from reduced snow removal costs and the improved efficiency that is bound to result from terminal operations conducted under cover.

Here's how PAA proposes to handle jet-age passengers with the new terminal: Passengers arriving at airport via ground transportation will be delivered to second-floor entrance where all major passenger facilities will be located.

Instead of the conventional entrance door, PAA terminal will be fitted with a 100-ft.-wide "curtain of air" which will obviate the need for passengers carrying luggage to push through heavy doors.

From the main terminal, passengers will be moved to the cabin level of the aircraft via an elevated passageway, eliminating the need to descend stairs, cross wet pavements and then ascend boarding ramps as in today's terminal operations.

The new terminal is scheduled to be completed in late 1958.



JET-AGE TERMINAL to be built by Pan American World Airways at New York International Airport will cost $8 million, is designed to handle a 160-passenger jet every 15 minutes. Dots indicate periphery of terminal roof that will cover aircraft while at ramp.

Congressmen cut $58 million from CAA budget request for $175 million in nav-aid funds in 1958

Economy-minded Congressmen upheld major reductions in the Civil Aeronautics Administration's request for fiscal 1958 funds. As the Commerce Department's appropriation bill sailed through the House, budget cutters sustained a committee cut of $58,438,140 from the agency's bid for $175 million to establish air navigation facilities.

House-approved amount, however, marked a $41,561,860 increase over that budgeted for this purpose in fiscal 1957.

House pared another $17,252,200 from CAA's operation and regulation request of $195,000,000—and sent the bill to the Senate, where Commerce Secretary Sinclair Weeks voiced an appeal for restoration of the nav-aid funds.

Lower branch, simultaneously, trimmed $469,600 from the Civil Aeronautics Board's request of $5,725,000 for salaries and expenses, knocking out 77 requested new positions—33 of which were earmarked for air safety.

Subsidy payments of $38,754,000 to air carriers were approved, representing a $3,586,000 decrease from 1957 subsidies. In a report to the House, the Appropriations Committee observed that the chief benefactors of government aid now are local service carriers, helicopter operators and several airlines operating in Latin America.

An economy drive that knifed deep into the full Commerce Department's request stopped short of the heart of air safety funds. Citing the urgency of the program, the Committee endorsed funds for installation and conversion of 367 Vortac facilities at an estimated cost of $64.5 million. The Committee approved $43 million for 1958 and recommended a transfer of $21.5 million from military funds to finance the rest.

Before completing the pruning action, the House lopped another $500,000 from a $2 million estimate for air navigation development.

Totally, the House okayed $328,325,660 for CAA in 1958—an increase of $82 million over 1957 funds, but down sharply from Budget Bureau estimate for next year.

Earlier, CAA officials disclosed to Congress plans for spending $810 million for airways equipment over a six-year period. Annual operating cost was set at $430 million to be financed chiefly by an airways users' charge.

The huge procurement plan is sliced into two three-year periods. It would call for increased spending from $246 million to $452 million during fiscal 1957-1959. Chief addition is a $132-million new Vortac installation program, plus costs for high altitude control and other items. Another $358 million would be spent to cover the 1960-1962 period of the ambitious program.

CAA holds up approval of Britannia 305

Civil Aeronautics Administration has set down four minor modifications it will require before formal approval of the Britannia 305 turboprop for use by Northeast Airlines later this year.

Bristol Aircraft, Ltd., is now making the modifications, none of which has to do with the Britannia's airworthiness. Principal points are: variation in the pivoting of main landing gear; nose-wheel yawing condition; turbine disc integrity; and provision of individual oxygen supply for passengers.

Convair gets $47-million contract for F-106Bs

Convair has received a $47-million contract from the Air Force for a quantity of F-106B all-weather interceptors, a two-seat version of the F-106A.

F-106A prototypes have been undergoing flight tests at Edwards Air Force Base since December. Both the F-106A and F-106B will be built at Convair's San Diego plant.

PROGRESS REPORT BY TCA

By 1961, all 4-engine... all turbine fleet to bring you new speed and comfort

The next few years will mark a revolutionary advance in air transportation. Present piston-engined types will be replaced by propeller-turbine and jet airliners. TCA, in the front rank of world airlines, will become the first intercontinental airline in the world to operate an all-turbine fleet.

The remodelling of the TCA fleet has already begun. In 1955, TCA introduced the now famous Viscount, and became the first airline in North America to fly turbo-prop aircraft.

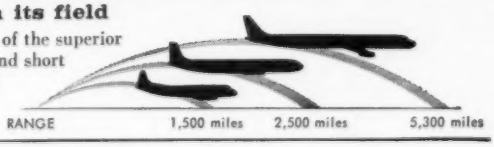
An order has been placed for 20 Vickers Vanguard airliners, powered by Rolls-Royce Tyne turbo-prop engines. Seating up to 102 passengers and flying at 420 miles per hour, the Vanguard will serve TCA's high-density inter-city and Southern routes. The Viscount, likely to be the best short-range aircraft for many years, will continue to serve short-range routes.

Giant Douglas DC-8 jetliners will round out TCA's re-equipment programme. Cruising at 550 miles per hour, carrying up to 120 passengers, they will cut flying times on trans-Continental and trans-Atlantic services by almost half.

The composition of this future fleet has been determined after years of exhaustive study and evaluation. It represents a balanced combination of aircraft best able to fulfill TCA's particular route requirements.

Three fine aircraft... each ahead in its field

In the Vanguard and Viscount, advantage will be taken of the superior operating qualities of turbo-prop aircraft over medium and short distances. The turbo-jet DC-8, with its higher speed, will realize its full potential on TCA's long distance routes.



TCA **TRANS-CANADA AIR LINES** *one of the world's great airlines*

KLM gets new routes to Houston and Dutch West Indies despite opposition of CAB and airlines

In an action that aroused widespread criticism in Congress and in the airline industry, the U.S. has awarded the Netherlands new routes to Houston and from the Netherlands Antilles (Dutch West Indies) to New York.

A government spokesman admitted frankly that "political factors" had influenced the awards to the Dutch. The Civil Aeronautics Board had opposed the granting of the routes.

The Dutch expressed their "disappointment" at being denied permission to serve Los Angeles and said they would seek this right "as soon as possible."

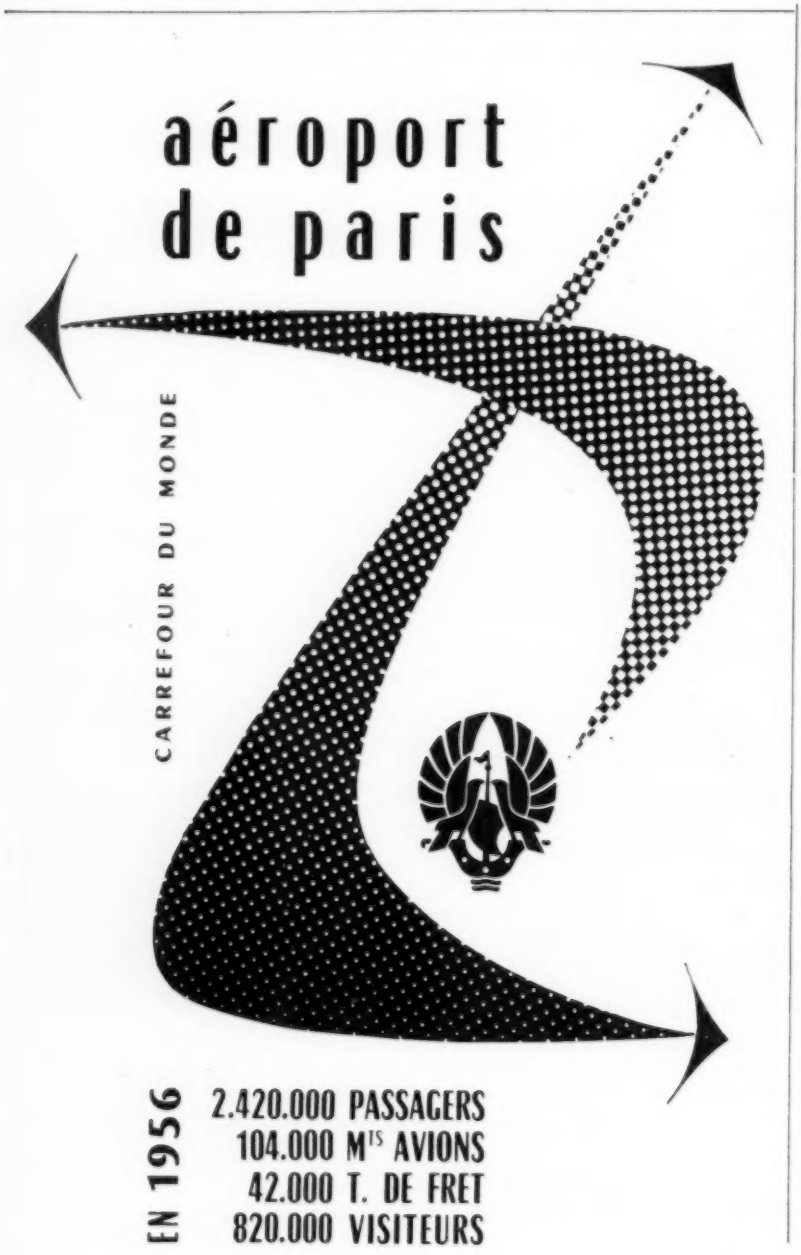
Route awards to the Dutch were: (1) the Netherlands via intermediate points in the United Kingdom, Ireland, Newfoundland and the Azores to New York, now being operated; (2) the Netherlands via intermediate points in the U.K., Ireland, Iceland, Greenland, Newfoundland, Azores and Montreal to Houston; (3) the Netherlands Antilles via the intermediate points Ciudad Trujillo, Port au Prince, Kingston, Montego Bay, Camaguey, Havana to Miami, now being operated, and (4) the Netherlands Antilles to New York.

The Dutch will not be able to haul passengers from Houston to Mexico City, or from Montreal to Houston.

The U.S. received: (1) from the U.S. via intermediate points to Amsterdam and beyond, (2) from the U.S. and/or an airport serving the Canal Zone via intermediate points to Aruba, Curacao, St. Maarten and Paramaribo and beyond. New in these awards are the unlimited "beyond" rights past Amsterdam, "beyond" rights past Paramaribo, and rights to serve Aruba and St. Maarten.

The Senate, irked over concessions to the Dutch, passed a bill that would limit Presidential authority to overrule CAB decisions in foreign air carrier cases. The bill would also permit U.S. domestic carrier representatives to sit in on international negotiations. Eventual approval by the House is expected.

Stuart Tipton, president of the Air Transport Association, said the State Department appears to consider American-flag aviation as "a sort of secondary thing, to be given away as a casual concession to other countries or to be surrendered as a pawn in the game of international politics."



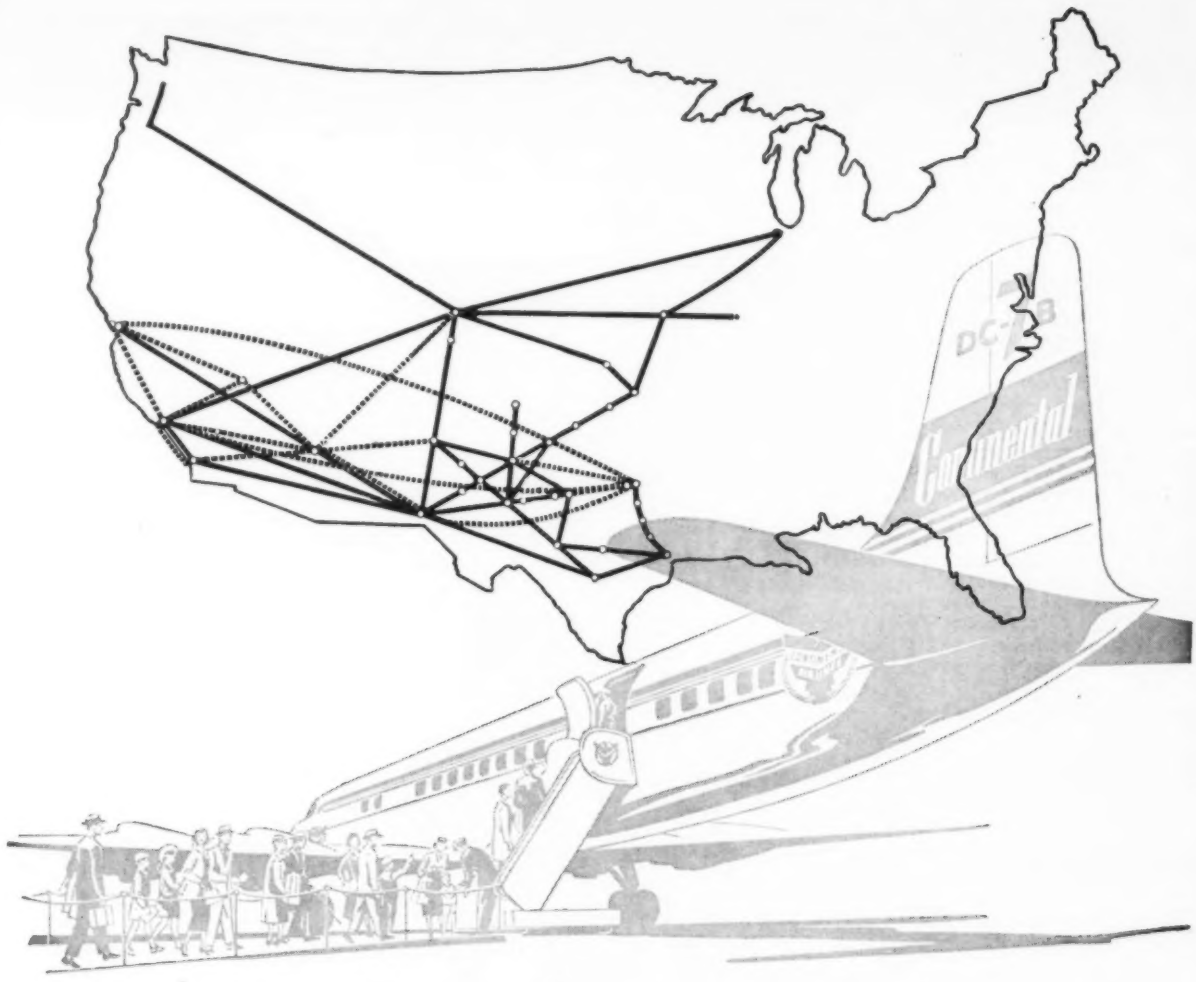
Navy awards contract for 'strap-on-back' copter

The Navy has awarded Rotor-Craft Corp., Glendale, Calif., with a contract for flight-test demonstration

of the "Pinwheel" strap-on-the-back rocket-powered helicopter.

Tests of the Pinwheel will take place at the Naval Air Test Center, Patuxent, Md. It was developed for the Marines under a Navy contract and is designed to fly an infantryman and his equipment about a battlefield.

Reports are that the Pinwheel can be flown by an average G.I. after a short ground course and about three hours' flight instruction. Rocket engines on the helicopter weigh less than a pound each and are located inside the tip of each rotor blade.



congratulations Continental

In this age of miracles, it's often easy to forget that initiative and courage—as well as money—are still basic ingredients of progress. Here's another example. We salute Continental's new DC-7B service as another important step in the development of air transportation.

Commercial aviation is indeed still pioneering, with big ideas, and big investment. We know something about this: for Janitrol's resources are being called upon to support challenging and ambitious developments in the manufacture of aircraft combustion heaters, equipment, couplings, pneumatic controls, hot fuel prime units, heat exchangers.

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CAB rejects IATA's proposed fare boost

Civil Aeronautics Board has voted against a 5% fare boost proposed for transatlantic service by the International Air Transport Association. Increase was to be in the form of a surcharge applicable to all transatlantic fares effective May 1.

Technically, CAB's action was described as "deferral with a view toward eventual disapproval." But the agency left little doubt of its opposition to the proposed fare hike and final disapproval appears certain.

Said CAB: "The increase in fuel and other costs cited as justification for the proposed fare increase is not, of itself, a determining factor in evaluating the cost position of the air transport industry. While U.S. domestic carriers have experienced a continuing series of increases in major cost components since 1950, the impact has not been reflected in a corresponding increase in the unit cost of operations. In general, the experience of the U.S. flag international carriers has been similar."

"It would appear," CAB added, "that the appropriate corrective action at this time is not an increase in the level of fares, but a basic realignment of all services so as to exploit efficiently the reasonable maximum capabilities of modern aircraft."

Board was also critical of the fact that IATA and not individual members advanced the fare increase. "Initiation of agreements by the Secretariat of IATA," said CAB, "appears unsound as a matter of policy, and represents a type of price-fixing procedure which the Board considers objectionable."

BRIEFS

Manufacturing

Hoffman Laboratories has received a $18,633,572 contract from the Navy Bureau of Aeronautics for ARN/21 and ARN/21A Tacan units.

Marquardt Aircraft Co.'s annual report disclosed it is developing the engine control system for General Electric's nuclear-powered turbojet engine.

General Electric Co. has received an $83-million contract to develop guidance for the Atlas ballistic missile. Work will be done at GE's Syracuse, N. Y., plant.

Northrop Aircraft has established a new division known as Northrop International, with responsibility for all overseas programs of the company.

Fokker Industria Aeronautica of Rio de Janeiro will build 100 F-27s for sale in Brazil, providing a third production source for the twin turboprop transport. Fairchild Engine and Aircraft is responsible for sales of the F-27 in all Western Hemisphere countries except Brazil.

Transport

Thomas B. Wilson, former deputy to Undersecretary of Commerce for Transportation, has become chairman of the board and a director of Resort Airlines of Delaware, succeeding Clinton Davidson.

West Coast Airlines, Inc., has ordered two additional F-27 twin-turboprops from Fairchild Engine and Aircraft Corp. Four had been on order previously.

National Airlines has ordered a Link electronic simulator for use in training crews for the 23 Lockheed Electras on order for delivery in fall of 1958. Simulator will be delivered six months before first Electra.

Ben Regan has been elected chairman of the board of Frontier Airlines, succeeding the late Louis E. Leverone. Regan has been a director since April 1954.

Ake John Rusck will become president of Scandinavian Airlines System January 1, replacing Henning Throne-Holst. Rusck has been director-general of the Swedish Power Administration since 1948.

FAIRCHILD F-27 JETPROPS TO JOIN SOUTHWEST'S MARTINLINER FLEET

Providing Fast Modern Service for America's Fastest Growing Market

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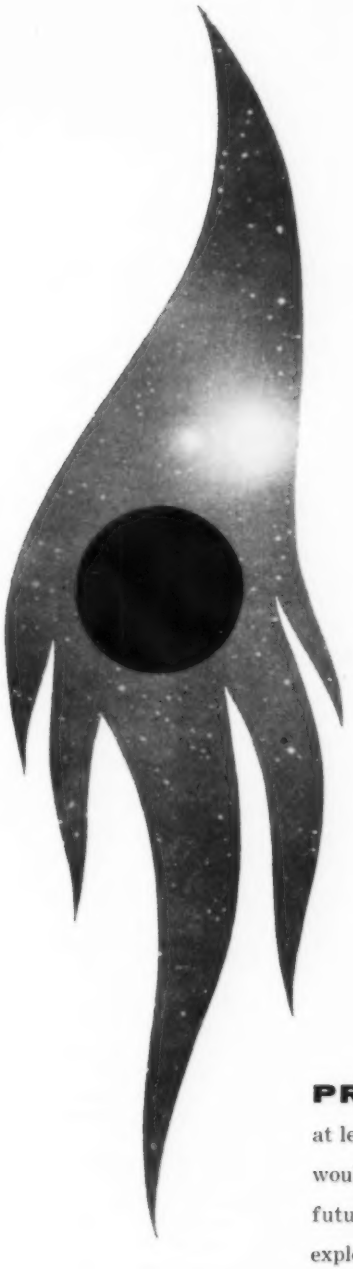

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MARTIN

BALTIMORE · DENVER · ORLANDO

Scheduled airlines' coach service dents nonsked transcontinental volume

Nonscheduled airlines are losing passenger traffic to scheduled carriers and are in danger of losing even more, but they aren't worrying too much, yet. Reason: they're still getting plenty of military and other contract business.

This situation was brought to light by a report on 1956 operations at Lockheed Air Terminal in Burbank, Calif. Nonsked passenger traffic volume at Burbank in 1956 was only 155,187, as compared with 220,360 in 1955—a drop of 29.6%.

Meanwhile, scheduled airlines carried 492,901 passengers in and out of the Lockheed terminal in 1956, a decline of only 4.6% from the 1955 figure of 516,793.

• **Observers** at the Lockheed terminal attribute the sharp decline in nonsked passengers to improved coach service of the scheduled carriers, notably American Airlines' DC-7 nonstop Royal Coachman flights and TWA's Super G Constellations. The latter combine coach flights with standard fares.

Had it not been for coach operations of the scheduled carriers, these observers say, the nonskeds would have shown a traffic gain for 1956.

Since the scheduled carriers operate their top coach flights to and from Los Angeles International Airport, the overall decline in transcontinental nonstop traffic at Burbank primarily reflects the nonskeds' loss of transcontinental nonstop coach passengers to the scheduled airlines.

Trans American Airlines, biggest of the nonskeds, which had built up to two and three sell-out roundtrips daily, is now operating, on the average, only one trip a day. And the Transcontinental Airlines group, comprising Currey Air Transport and Great Lakes Airlines, which formerly flew not less than one roundtrip daily, is now flying only one or two a week.

Starting with the new summer schedules on April 28, the nonskeds face the likelihood of a further loss in common carriage operations. American Airlines is adding 11 more DC-7 coaches to its fleet to expand its popular Royal Coachman service. United Air Lines will add a brand new DC-7 coach service to its present DC-6 coach service. That makes three scheduled carriers operating high-speed nonstop coast-to-coast tourist flights.

Like American's Royal Coachman, UAL's DC-7 coaches will be dressed up in deluxe style, including staggered rows of four-and five-abreast seating.

DC-7s are also about to enter the Florida coach market in which the nonskeds have done such a landoffice business. Eastern Air Lines and Delta Air Lines are both setting up DC-7 tourist flights as soon as they get the equipment.

• **Despite this heavy competition,** the nonskeds will not shed too many tears if their military and contract operations continue to hold up. Business is brisk in these categories. Trans American has branched out into contract flights both in the Atlantic and the Pacific on a substantial scale. So has Great Lakes Airlines.

Recently a Trans American plane rolled up at the gate at Lockheed terminal, carrying Hungarian refugees flown from Vienna.

Despite its legal difficulties and its loss of nonstop transcontinental passengers, Trans American is adding five more DC-6As to its fleet, two of which already have been delivered. In 1956, Trans American had two 102-passenger DC-6As in operation on its coast-to-coast schedules.

Great Lakes and Currey are following Trans American's example by acquiring DC-6As to replace DC-4 equipment. Nevada Aero Trades, a holding company for equipment operated by these two carriers, has two DC-6As on order and an option on two more.

Two other "supplemental" carriers with DC-6As on order are Los Angeles Air Service and S.S.W., Inc.

None of these DC-6A orders have been formally announced either by Douglas Aircraft Co. or by the nonskeds themselves.

• **While commercial passenger volume** fell off at Lockheed Air Terminal in 1956, there was a solid increase in air cargo tonnage. Year's total for airfreight in and out of the airport reached 40,418,000 lbs. as compared with 35,852,000 lbs. in 1955.

Total flight activity showed a gain, too, despite the passenger drop and a decline in Lockheed Aircraft Corp.'s own flight activity. All told, there were 153,681 flights in and out of the terminal in 1956, as against 143,886 in 1955.

Lockheed Air Terminal Flight Activity

	1956	1955
Private aircraft	91,356	74,751
Commercial passenger aircraft	31,123	38,548
Military aircraft	20,595	17,081
Cargo aircraft	5,387	5,104
Inter-company aircraft	5,220	8,402
Totals	153,681	143,886

New York City must be ready to handle 21 million passengers in 1965, PNYA predicts

New York City's airports will be called on to handle 21 million passengers in 1965 and 38 million passengers in 1975, according to a Port of New York Authority forecast which figures total U.S. domestic passenger traffic will increase four-fold in the 20 years between 1955 and 1975.

As seen by PNYA's Forecast and Analysis Division, domestic traffic will climb from the 38.7 million passengers in 1956 to 90 million in 1965 and to 167 million by 1975. New York City airports handled 9.5 million passengers in 1955. This was increased 11.6% in 1956 to 12.1 million passengers.

For the study, PNYA adopted an approach not generally used by travel forecasters. The Authority's forecast assumes that air travel is essentially a commodity—one of many in competition for the buyer's dollar.

The Agency divided passengers into business and non-business travelers. The non-business travelers were further divided into categories according to income, age, education and occupation. For business travel, categories of occupation, industry and income were used. Each group's rate of acceptance of air travel was computed, and then applied to population forecasts (from government sources).

In a survey conducted preparatory to making the forecasts, it was found that fear is still the most important single deterrent to air travel among non-fliers. Other major obstacles to the development of air travel included the idea that flying is expensive and not dependable. If these deterrents are overcome, air travel will increase rapidly.

CAA to institute high-altitude ATC

Civil Aeronautics Administration will institute high-altitude traffic control in the airspace above 24,000 ft. within the next 60 to 90 days, according to Administrator James T. Pyle.

Pyle said this would more than triple the number of square miles of air space controlled by CAA, but stressed that the move applies only to airspace above 24,000 ft. to all traffic. He said CAA has set January 1958 as the target for implementing a second phase of the program which would lower the floor of "all airspace IFR control" to 15,000 ft.

ADVERTISERS' INDEX

A C Spark Plug Div.—General Motors Corp. 106
AVCO Manufacturing Corp., Crosley Division 63
Aero Design & Engineering Company 81
Aeroquip Corporation 150, 151
Aerotherm Corporation, The 130
Air Associates, Inc. 61
Air Cruiser Co., Div.—The Garrett Corp. 148
Air France 84
Aircraft Radio Corporation 176
Airwork Corporation 92
Allegheny Airlines, Inc. 128
Allison Division, General Motors Corp. 40
American Airlines, Inc. 34
American Photocopy Equipment Co. 145, 146
Amphenol Electronics Corp. 4
Associated Aviation Underwriters 46
B & H Instrument Co., Inc. 158
Babb Company, Inc., The 27
Beech Aircraft Corp. 125
Bendix Aviation Corp.,
Bendix Products Div. 64
Bendix Radio Div. 121
Scintilla Div. 160
Bernco Engineering Corp. 155
Blythe Aircraft Corp. 50
Boeing Airplane Company 75
Bonanza Air Lines, Inc 76
Braniff International Airways, Inc. 78
Bristol Aeroplane Co., Ltd., The 24, 25
British European Airways Corp. 73
Bulletin Board (Classified) 196
Canadair Limited,
a Sub. of General Dynamics Corp. 30
Cannon Electric Company 165
Capital Airlines, Inc. 49
Cee-Bee Chemical Company, Inc. 163
Cessna Aircraft Co. 82
Clary Corp.,
Aircraft Division 14
Collins Radio Company 94, 95
Continental Air Lines, Inc. 116, 117
Continental Motors 164
CONVAIR—A Division of General Dynamics Corp. 1
Curran Corp. 48
Curtiss-Wright Corp. 44
Dallas Airmotive, Inc. 159
Delta Air Lines, Inc. 122
Eastern Air Lines, Inc. 104
Edo Corporation 23
Electric Storage Battery Co., The,
Exide Industrial Div. 118
Esso Export Corp. 127
Ethiopian Airlines, Inc. 138
Fairchild Engine & Airplane Corp. 3
Fairchild Engine & Airplane Corp.,
Aircraft Division 26
Flight Equipment & Engineering Corp. 138
Frontier Airlines, Inc. 114
General Laboratory Associates, Inc. 153
B. F. Goodrich Aviation Products,
a Div.—The B. F. Goodrich Co. 88, 89
Gulf Oil Corp. 142
Hoffman Laboratories, Inc.
Sub. of Hoffman Electronics Corp. 20
International Business Machines 51
Jack & Heintz, Inc. 53
Janitrol Aircraft-Automotive Div.,
Surface Combustion Corp. 191
Joy Manufacturing Co. 5
KLM Royal Dutch Airlines 85
Kearfott Company, Inc. 80
Kelsey-Hayes Wheel Company 66
Hotel Lexington 50
Link Aviation, Inc. 140
Lockheed Aircraft Corp. 56, 57
Marman Products Co., Inc.,
a Sub. of Aeroquip Corp. 58
Martin Co., The 193
McDonnell Aircraft Corp. 99
Mohawk Airlines, Inc. 16
Motor Generator Corp. 154
D. Napier & Son, Ltd. 11
National Airlines, Inc. 100
New York Air Brake Co., The,
Watertown Div. 43
North American Aviation, Inc.,
Rocketdyne Div. 129
North Central Airlines, Inc. 79
Northeast Airlines, Inc. 77
Northrop Aircraft, Inc. 102
John Oster Mfg. Co.,
Avionic Div. 187
Ozark Air Lines, Inc. 186
Pacific Airmotive Corp. 86, 87
Pacific Northern Airlines, Inc. 101
Pan American-Grace Airways, Inc. 131
Pan American World Airways, Inc. 18, 19
Paper Manufacturers Company 10
Aeroport de Paris 192
Phillips Petroleum Company 200
Piedmont Airlines 21
Pratt & Whitney Aircraft Div.,
United Aircraft Corp. 12, 13
Radio Corporation of America 134
Resistoflex Corporation 168
Ralph C. Robinson Company 152
Rocketdyne,
A Div. of North American Aviation, Inc. 129
Rodney Metals, Inc. 123
Rolls-Royce, Limited 133
Rotol Limited 70
Scandinavian Airlines System, Inc. 115
Scott Aviation Corp. 105
Scottish Aviation Limited 120
Seaboard & Western Airlines, Inc. 166
Servomechanisms, Inc. 199
Sikorsky Aircraft Div.
United Aircraft Company 182, 183
Simmonds Aerocessories, Inc. 171
Sinclair Refining Company 28, 29
Slick Airways, Inc. 91
Solar Aircraft Company 137
Southern Airways Company 90
Southwest Airmotive Company 139
Southwest Airways Company 192
Sperry Gyroscope Co.,
Div. of The Sperry Rand Corp. 22
Stewart-Warner Electronics,
a Div. Stewart-Warner Corp. 172
Sud Aviation ..... 107 thru 112, 185
Swedlow Plastics Company 15
Switlik Parachute Co., Inc. 90
Technical Development Co. 132
Temco Aircraft Corp. 17
George A. Terry Company 124
Texas Company, The 6
Trans Canada Air Lines 189
Trans World Airlines, Inc. 72
Trans-Texas Airways 124
United Air Lines, Inc. 180
Vertol Aircraft Corporation 39
Vickers Incorporated,
Div. of The Sperry Rand Corp. 178
Vickers-Armstrongs (Aircraft) Ltd. 97
Wakmann Watch Co., The 89
Watertown Division,
New York Air Brake Co., The 43
Weber Aircraft Corp. 162
West Coast Airlines, Inc. 132
Western Airlines, Inc. 8
Wm. R. Whittaker Co., Ltd. 157
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HONORS

Dr. Edward Warner, president of the Council of the International Civil Aviation Organization in Montreal, became the first honorary member of the International Society of Aviation Writers.

Senator Stuart Symington was named "Man-of-the-Month" for April by the National Aviation Club.

Dr. Bernard Salzberg, formerly with the Naval Research Laboratory and now Chief Scientist of Airborne Instrument Laboratory, has been presented the Department of the Navy's Meritorious Civilian Service Award in recognition of his many contributions to the Laboratory's programs and to the field of electronics.

Gen. Edwin W. Rawlings, Commander of the Air Materiel Command, will receive the Gen. William Mitchell Award of Aviators' Post No. 743 of the American Legion, as the person who has done the most for aviation in the past year.

Frederick B. Rentschler, founder and chief executive officer of Pratt & Whitney Aircraft and later chairman of United Aircraft Corp., was awarded posthumously the Daniel Guggenheim Medal, an annual international award honoring persons who make notable achievements in the advancement of aeronautics.

Dr. Walter R. Dornberger, technical consultant for Bell Aircraft's Research Div., has been named chairman of the Spacecraft Systems Subcommittee of the Space Flight Technical Committee of American Rocket Society.

L. J. Brugman, KLM's Senior Captain, has been appointed Commodore, a title and rank unique in the airline's flying corps.

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OTHER PUBLICATIONS AND SERVICES . . . **American Aviation Daily:** Daily News service for the entire industry, $200 per year. Managing Editor—Keith Saunders. **American Aviation World-Wide Directory:** Twice-yearly listing of products, people and organization, $9.00 each (U.S.A. and Canada); $10.00 each Overseas. Managing Editor—Marion E. Grambow. **Official Airline Guide:** Monthly publication of airline schedules, fares. World-Wide Edition: $19.50 per year, everywhere. North American Edition: $13.50 per year in U.S.A. $14.00 in Canada; $15.00 elsewhere. Published from 139 N. Clark St., Chicago 2, Ill. Phone: Central 6-5804. Managing Director—Robert R. Parrish. **Missiles and Rockets:** Magazine of World Astronautics. For those in missiles and rocket industry and satellite science, $8.00 for 1 year; $12.00 for 2 years (U.S.A. and Canada); Overseas—$9.00 for 1 year; $14.00 for 2 years. Managing Editor—Erik Bergaust. **Air Traffic News (Incorporating Air Traffic Digest)** Daily rates and tariff news, $200 per year; Managing Editor—Mary Miller. **Airports:** Weekly newsletter for airport officials, suppliers and services. Air mailed every Friday, $25 per year. Managing Editor—Wallace I. Longstreth. **Air Information Division,** 595 Broad Avenue, Ridgefield, N. J. Phone: Whitney 5-8850. Director—Edward H. Henkler. **Who's Who in World Aviation:** First Edition over 2,000 biographies of aviation's leaders, 345 pp. Deluxe bound, $10.00 per copy, postpaid. **Aircraft Year Book. Aviation Facts and Figures** (Official Publications of Aircraft Industries Association).

EN ROUTE

by Wayne W. Parrish

Flying over the North Pole--SAS style

. . . it was almost too easy

WELL I HAVE FINALLY JOINED the ranks of the intrepid Arctic explorers and flown over the North Pole. I'm telling you, it was a terrific battle against the elements. There were times when I doubted whether the food and drink would hold out, but we made it.

All I can say is that Scandinavian Airlines System has done it again. Early in 1954 I was on a familiarization flight pioneering the Los Angeles-Copenhagen route via Greenland and I thought that was quite a trip. But the new Copenhagen-North Pole-Anchorage-Tokyo route is something out of—and on top of—this world.

Strictly hardship all the way. In 1954 the steward apologized profusely for running out of red wine during the multiple course meal. I thought that was a pretty miserable slip-up for an Arctic expedition. On this trip we got Pommery 1949 champagne and I had been led to believe we were going to be served 1947 bubbly stuff. Anybody knows that 1947 is better. It is a dirty stinking way to conduct a polar expedition by pawning off 1949 Pommery and I want to register my complaint as loudly as I can. I drank it only under protest!

After arriving in Tokyo I began wondering why those explorers such as Amundsen and Peary and Byrd made such a fuss about reaching the North Pole. And took so long doing it, too. They sure didn't use the right technique. All they had to do was to board SAS in Copenhagen and fly straight north and come down the other side at Anchorage in less than 18 hours and they would have saved themselves a lot of shivering trying to reach the place by dog sled.

Anybody can do it

I suppose SAS ought to be ashamed of itself in a way. It has knocked into a shambles the whole history of rugged polar exploration. It has wiped out all the mystery of the far North. Today anybody with the price of a ticket can see the North Pole in complete comfort. I have never been on a smoother flight anywhere. It is so routine that the captain has to get on the intercom and announce when you're over the Pole and if he misses it by a few hundred miles it couldn't make much difference because there's nothing but ice splashed all over the top of the globe anyway.

By the time we reached Tokyo I had acquired a profound respect for the DC-7C with its truly remarkable range and for those four Curtiss-Wright Turbo Compound engines which never whimpered on the whole trip. We left Copenhagen with 7,824 U.S. gallons of gas, no small load, and 47 passengers and crew of 11 and, take it from me, that's a pretty hefty lift for a commercial airplane considering all the baggage, food, drink and other stuff we had on board.

Generally speaking it's an 8,000-mile trip from Copenhagen to Tokyo, but the main hop as far as Anchorage is something around 4,500 statute miles. We made this hop in 17 hours and 44 minutes, and the Anchorage-Tokyo hop of 3,600 miles in 13 hours and 54 minutes, or 31 hours and 38 minutes for the 8,060 mile total. In Anchorage we had a special four-hour stopover for some local celebrations so the whole trip was pretty long.

One thing for sure, flying over the pole messes up the clock. We left Copenhagen at noon local time and landed in Anchorage at breakfast time according to our Copenhagen stomachs. But it was early evening in Anchorage. I mean early evening the same day we left Copenhagen, only to our stomachs and elapsed time it was next morning. You begin passing meridians and time zones so fast up near the pole you'd think they were streaks of light from the aurora borealis.

It's a strange feeling

And by the way, SAS sure flopped on that one. No northern lights at all. Just a clear sky and moonlight. Might as well have been flying over Texas. I had begun to think SAS could do anything at all until it failed to produce a spectacular aurora borealis.

But even though it was a remarkably routine trip, we were all fully aware of its historical importance. And you get a strange feeling flying over the top of the world where on the left side of the plane it's dark and on the right side the sun is shining low. On the left was North America in nighttime, and on the right was the sun shining over Asia and Siberia and Russia and India and Africa. It's a real lesson in geography and all that sort of thing.

I thought it would be completely dark up at the top, since it's really midnight for half the year, but actually it was always light enough to see the ice cap and the huge cracks and crevices which make surface expeditions hazardous up there. In the summertime it will be light all the time and passengers should have some truly spectacular views of the ice cap. On our trip we flew at 10,000 feet all the way until we reached Alaska, where we went to 16,000.

Coming down from the Pole to Anchorage by way of Fairbanks, we crossed over the most beautiful winter mountain scenery I've ever seen. It was just like a fairyland, more beautiful in the late afternoon dusk than anything I've seen in Switzerland or elsewhere.

One of the VIP's on board was Hjalmer Riiser-Larsen, who was navigator on Roald Amundsen's airship, the Norge, on the famous transpolar flight of 1926. Riiser-Larsen reminded everybody that Kipling had said that "east is east and west is west and ne'er the twain shall meet" and how wrong Kipling was because east meets west at the North Pole. It was certainly true because when we got to the Pole it seemed that every direction met there except that we ran out of north.

Success seems assured

What else can be said about the expedition? It was so well organized and it operated so smoothly that the best description is simply "routine." For my money SAS, which is an unsubsidized airline, deserves an enormous amount of credit for pioneering the polar route, just as it astonished the world with its successful Los Angeles-Copenhagen route.

Will the new route be a success? It's bound to be, at least until a good express east-west route is open through the U.S.S.R. Even then I suspect there are hundreds of thousands of people in the world who will want to fly over the pole just for the thrills. Although this is strictly a Europe-Far East route, I am sure there are a great many Americans who will go out of their way to fly the polar route. So SAS will not only benefit from strictly commercial travelers, since the route saves much time and distance, but it should keep the seats filled with tourists as well. Where else is the air traveler offered such a novelty?

It's a long trip in an airplane. Thirty to thirty-two hours is a long flight no matter where you're flying. But it is a rewarding one. I wouldn't have missed it for anything. It gives you a perspective of the globe you can't get any other way. You can sit comfortably in a good seat and visualize the whole globe out your window. In the summertime you can follow the sun in its complete circuit around the world.

The SAS route is figuratively out of this world—and very literally it's on top and over the world.

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76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
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76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
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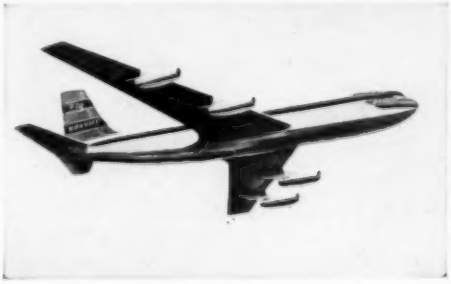
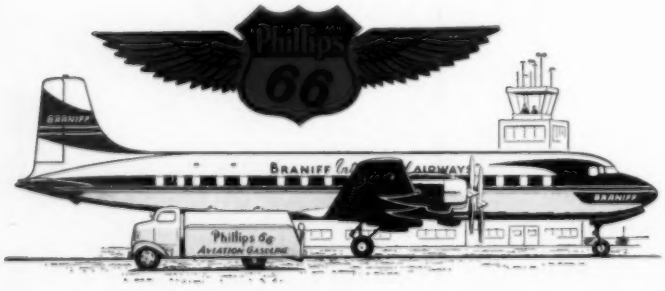
The new "El Dorado" has an operational non-stop capacity of more than 5,000 miles. Reduction of noise and vibration, weather mapping radar and combination first class-air coach service are features of the new "El Dorado".



Braniff's new 707 jet transports will permit these typical flying schedules: Dallas-Chicago, 1 hr., 38 min.; Houston-Chicago, 1 hr., 53 min.; Fort Worth-Washington, D. C., 2 hr., 15 min.; Dallas-New York, 2 hr., 36 min.



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